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MODERN Plastics

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February An investigation of the physical properties of acrylic resins used as denture base materials was undertaken by the American Dental Association Fellowship at the National Bureau of Standards during the past year and the report (read before the Full Denture Prosthetic Section of the American Dental Association, July 19, 1939, and published in the Journal of the American Dental Association, November 1939) will appear in our February number. There will be a discussion also, written by D. A. Dearle, of the comparative costs between compression and injection molding. Material costs and mold capacity are both considered in the tabulations.

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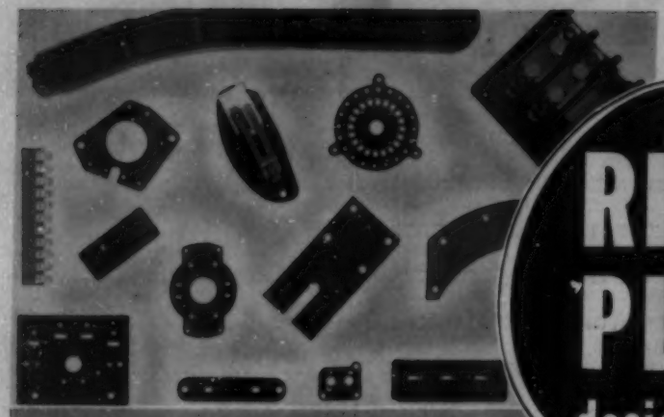
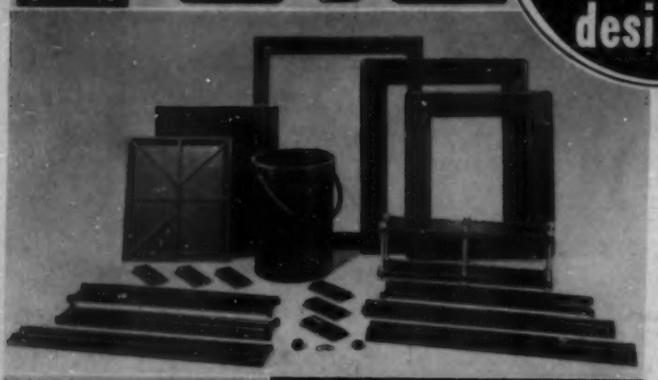
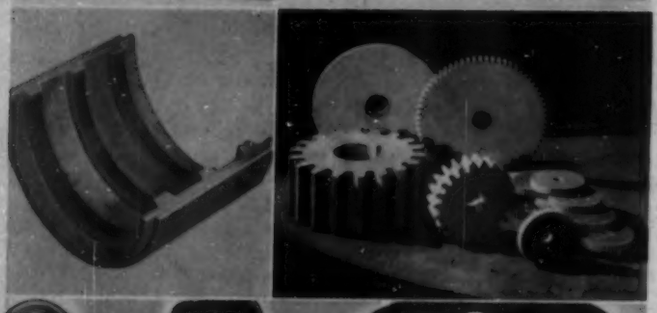


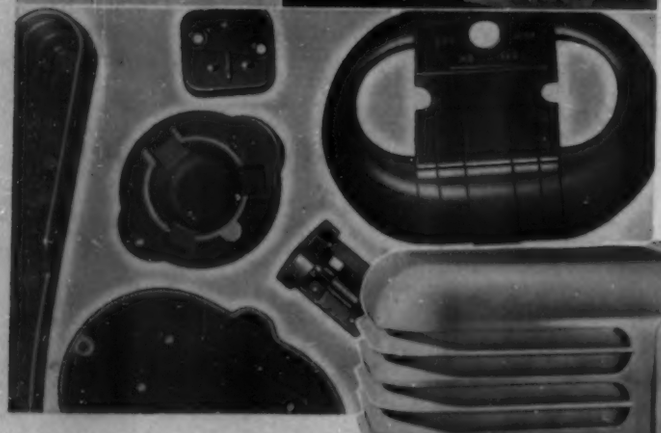
RICHARDSON PLASTICS for master designers and product engineers





Unbelievably diversified are the uses of Richardson plastics by engineers and designers in countless products and manufacturing equipment. In steel, paper, textiles, foods, ink, chemicals, printing, transportation, paint, floor coverings, electrical, communications, automotive and other industries, Richardson plastics are giving outstanding service, and suggesting further uses for these versatile materials. Consult Richardson engineers about any plastics application you have under consideration.

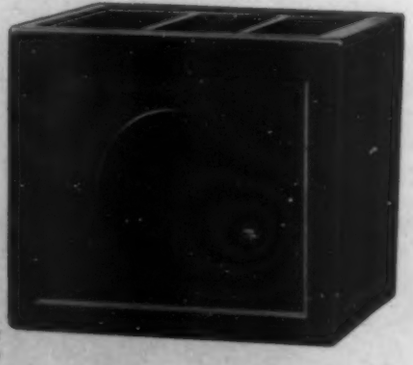
INSUROK, the superior plastic, is available in sheets, rods and tubes, in many grades, sizes, thicknesses and finishes for fabrication in your own plant—or completely finished parts ready for assembly. Tough, durable, strong, light in weight. Highly dielectric. For gears and bearings and other production equipment, INSUROK offers many profitable advantages. Get the facts about Laminated and Molded INSUROK. Write for complete details.



Radio by Belmont Radio Corp.

RUB-TEX

Molded hard rubber for electrical insulation, acid handling equipment and numerous other industrial applications.



EBROK

Widely used bituminous plastic for battery cases. Acid-resisting. Highly dielectric. Durable. Long-wearing.

The RICHARDSON COMPANY

MODERN PLASTICS

JANUARY 1940 VOLUME 17 NUMBER 5

This view of the molding room at Ford Motor Co., shows the compact arrangement of both injection and compression presses. Note direct gravity feed of material to injection presses from balcony powder supply

Ford and Plastics

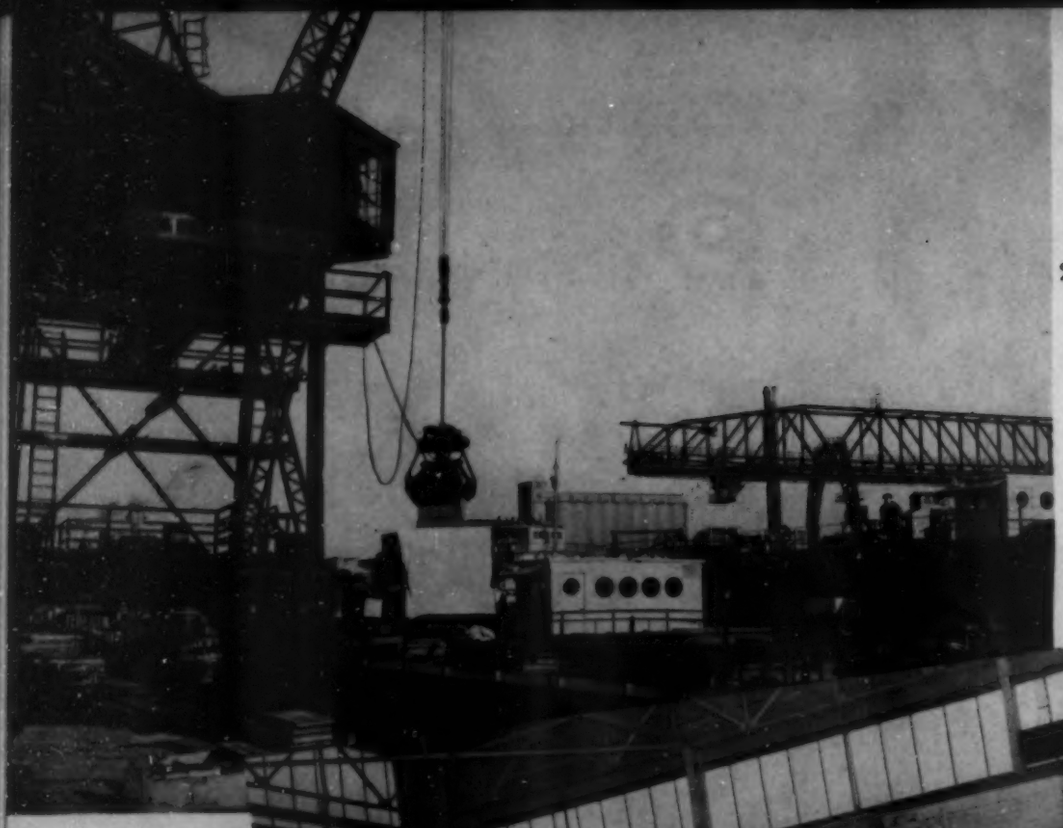
by WM. T. CRUSE*

INSCRIBED prominently on the walls of the Ford rotunda at Dearborn is the following quotation: "*There is nothing permanent about this organization except change.*" It is this spirit, indeed which has both cradled and nurtured Mr. Ford's progress in the art of synthetic plastics. Born of Ford's desire to build into his cars the maximum in performance, quality and style, plastics logically came upon Dearborn's resourceful scientific scene. The sponsorship of propitious large scale production has fostered their growth until now Ford's plastics are an essential integrated part of his industrial scheme, sharing honors with extensively used natural raw materials.

The agricultural reverberations of Ford's extensive use of soybeans as a basis for certain plastic ingredients, has a sociological aspect to be taken into account by agronomic prognosticators.

The plastics operations at the Ford plant devolve into two broad types of molding—conventional or com-

* Celluloid Corp.



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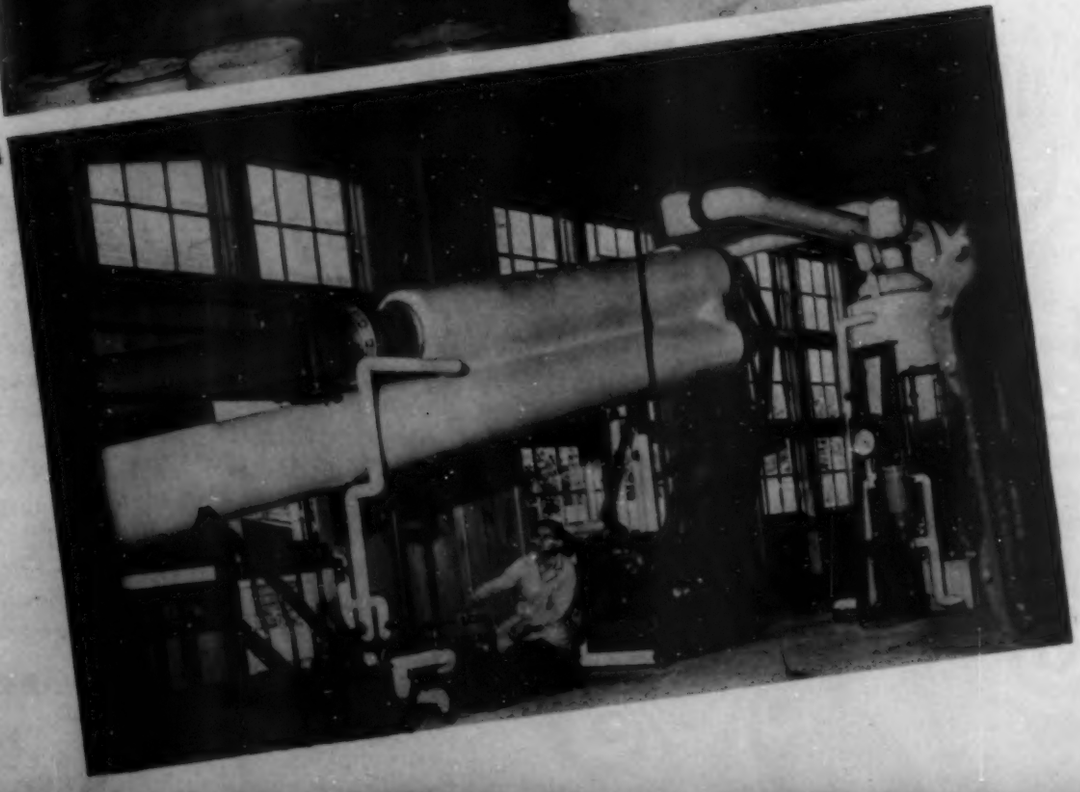

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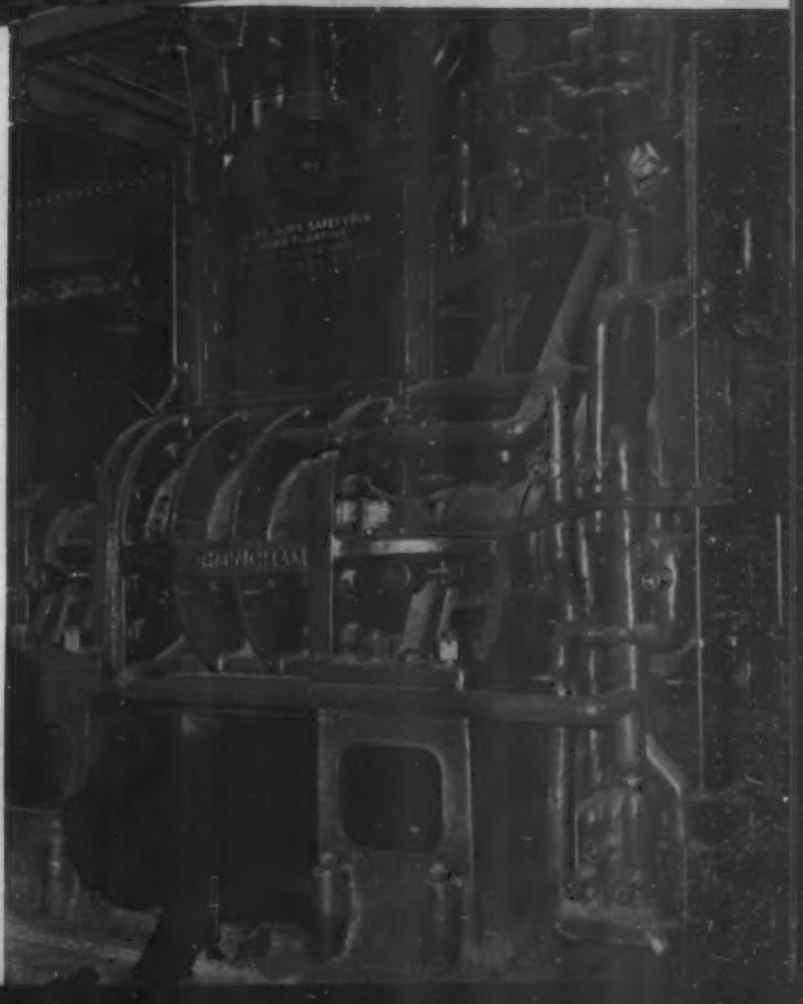
"Motor Car Materials from the Farm" are more than a theory at the Ford plant. Soybeans, more than 70,000 bushels of them, are being unloaded **2** at the River Rouge plant from the Ford canal boat, *Green Island*. Oil from the beans is extracted **4** and used in the manufacture of enamel for Ford and Mercury cars. The meal left after the oil is extracted **3** goes principally into the manufacture of plastic parts such as the distributor coil, coil case, accelerator foot pedal and many others. Figs. **5–6** illustrate two of the grinding operations necessary to convert the soybean plastic into molding compound



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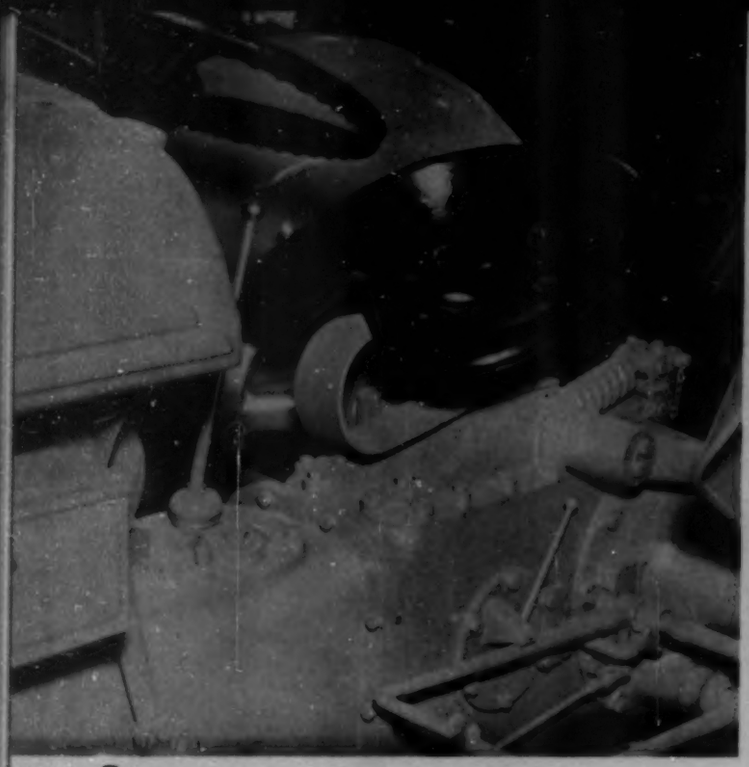

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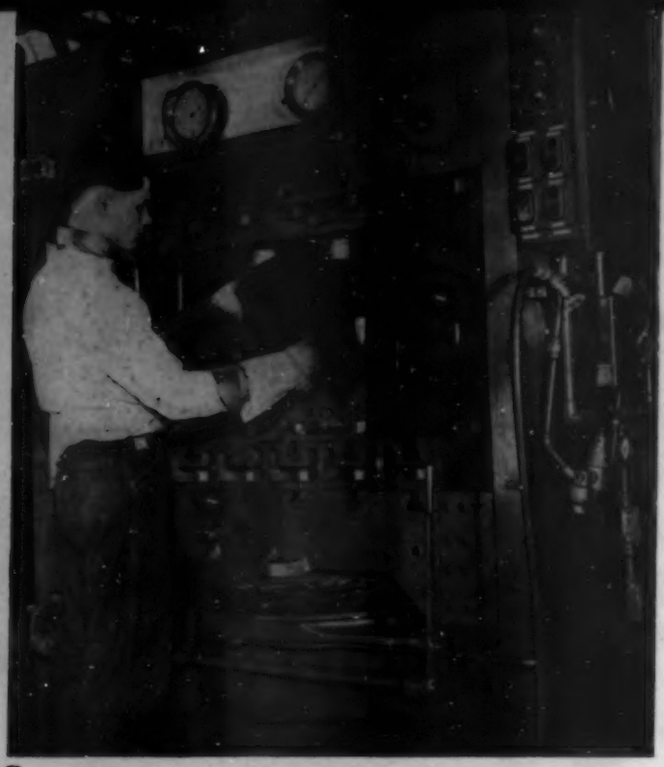

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Ford tractor seats **7** are now molded in production **8** from soybean plastic. Ventilating holes are molded in during the pressing operation and the seats come from the mold with a permanent finish ready to assemble. Trunk compartment doors **9** for Mercury cars are being molded experimentally on this 1200-ton press **10** at the Ford plant. Almost the entire surface, nearly 3 ft. by 4 ft., is curved in contour and the piece is preformed before pressing. The mold can be heated in two minutes and cooled in the same length of time. These are not in production and none has been released yet in cars on the market. Fig. **11** illustrates some of the acetate parts common to Ford production—top, instrument panel escutcheons; center, Mercury instrument panel parts, all injected; below, interior electrical shades. This panel **12** in the engineers' office at the Ford plant catalogs the decorative plastic parts of each assembly

pression, and injection. The molding material for compression molding is largely manufactured in the plant at Dearborn. It is widely known as *Soybean Plastic* and rightfully so, for the product of soybean refinement contributes the essentials of this molding powder. Until Mr. Ford undertook the exploration of the versatile agricultural and industrial possibilities of soybeans, they were but little known and inextensively raised in this country. China has for ages intensively raised them for their food value.

By a relatively simple solvent extraction process, oils are extracted from the beans leaving a protein meal. With the addition to this of phenol and formaldehyde, a protein-phenol-formaldehyde product results. There is then added to this, zinc stearate and stearic acid to serve as mold lubricants and pigments for color.

The Ford chemists in their systematic scientific research have explored the synthetic textile possibilities of soybean derivatives. Pilot production quantities of yarn have been processed. This work is in its early experimental stages.

The soybean compound is molded into a variety of parts found on the automobiles of Ford's manufacture. Among the earliest of all automotive plastic applications were the distributor and coil case—initially, as today, made from phenolic type-plastic because of exceptional electrical properties. Produced on large presses with multiple cavity dies, production on these for all cars and tractors is standard at the Ford plant.

Another part produced constantly on a similar scale is the accelerator pedal. Currently, the Ford technicians have done some extremely interesting development work. They have molded experimentally, but only experimentally, rear deck doors. If these become commercial, they will be some of the largest pieces which have been produced and used by an automobile manufacturer. Their perfection would eliminate costly finishing and also many mechanical operations employed where metal is used. The dies and presses developed for these rear deck doors are the largest in the plastics department of the Ford factory.

Ford's tractors also have benefited from his plastics program. Very recently after experimental work had been completed a newly designed seat was released for production. Here a difficult molding problem involving a long draw was solved by using a papier maché contour impregnated with bonding material.

Injection molding at the Ford factory is of more recent date; the types of parts thereby produced differ appreciably from those compression molded, in that they are principally used for car interiors. Here, not only utility but color also is a desirable characteristic. On these accounts, thermoplastic cellulosic plastic powders have been used. The soybean types, being thermosetting and lacking flexible color range, are not suitable for such purposes.

An installed battery of fourteen injection presses with a laboratory control unit enables the plastics de-

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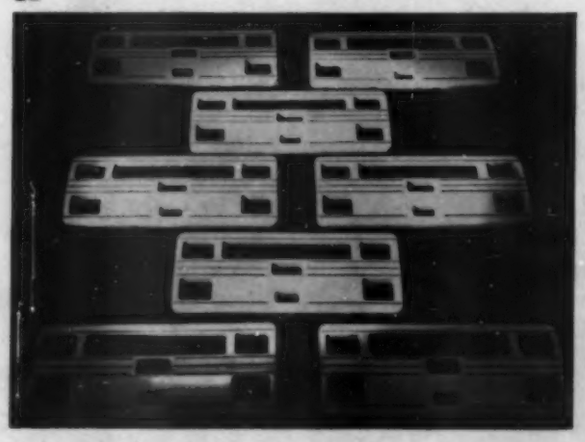

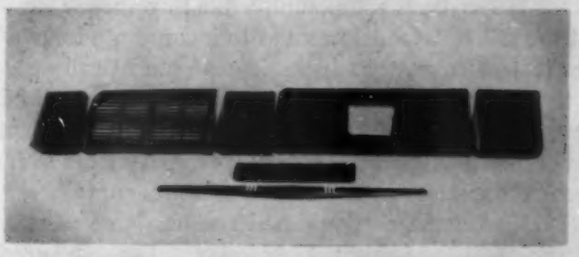

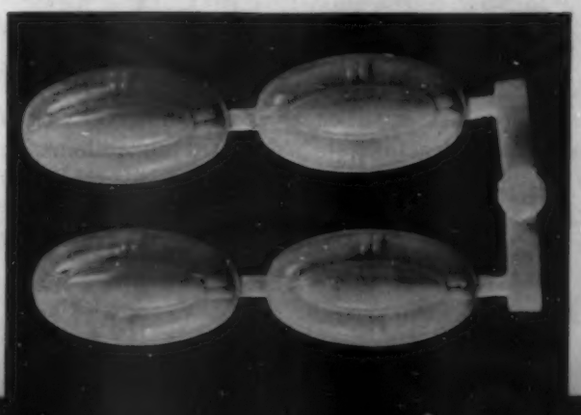

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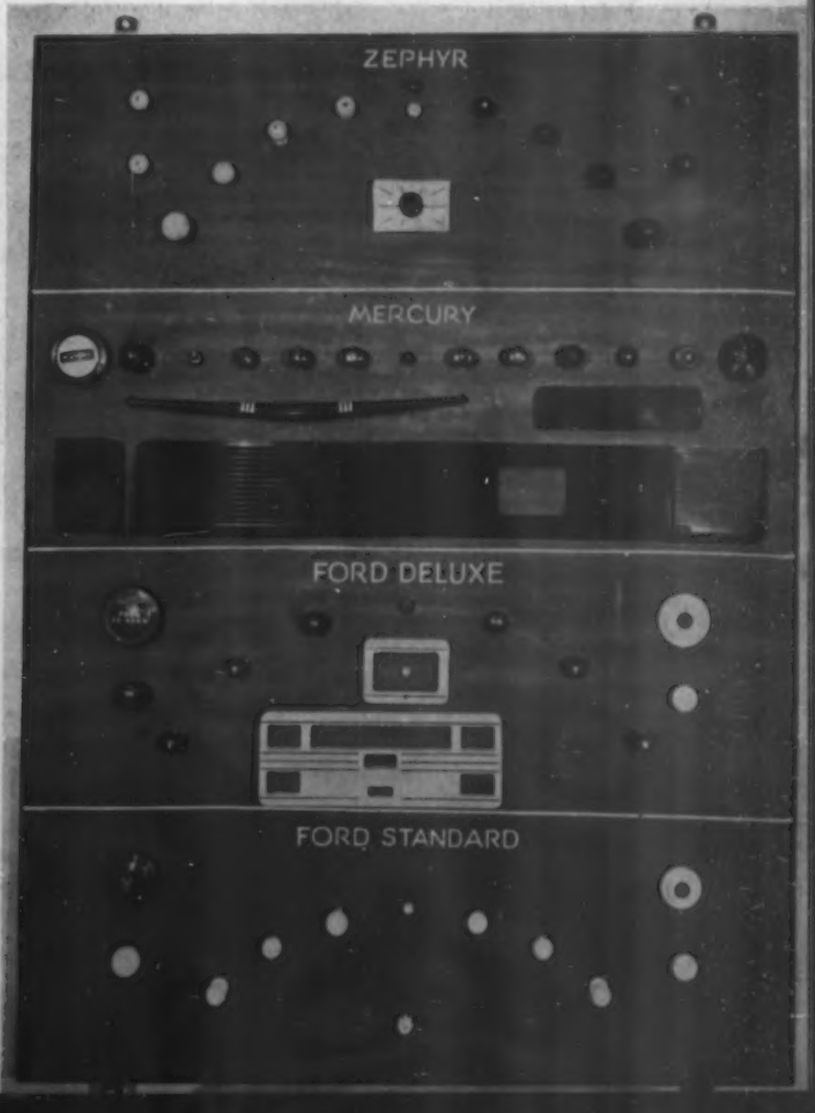

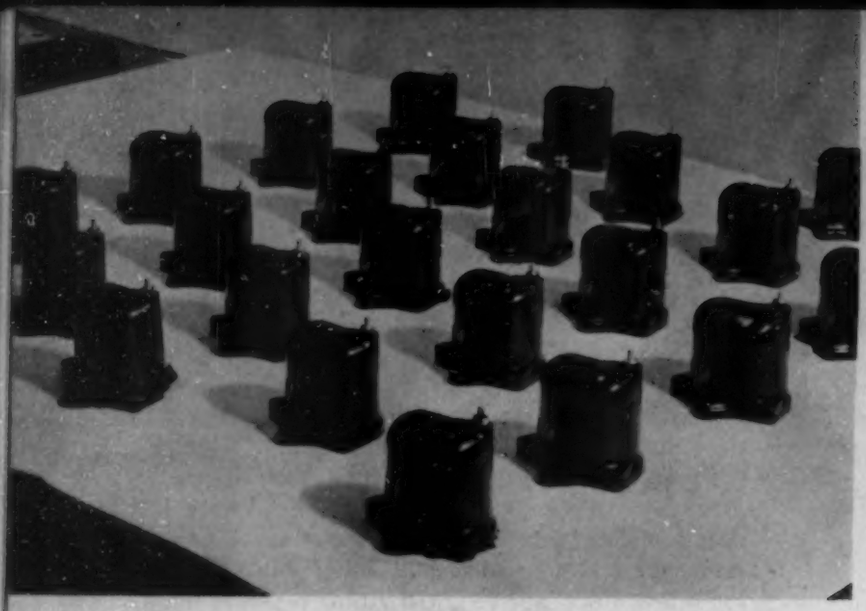

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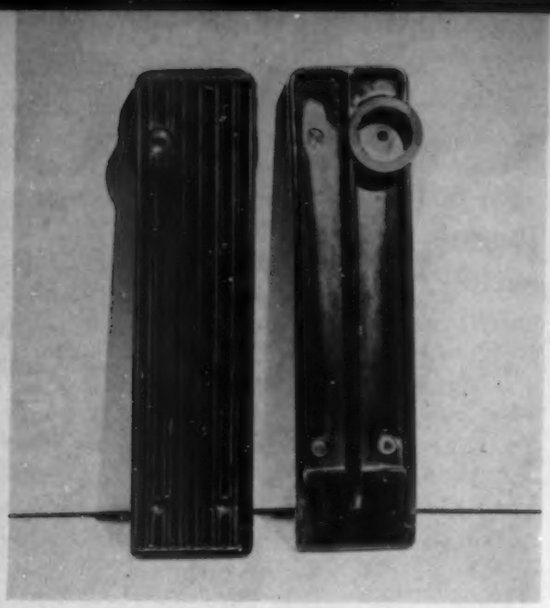

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Distributor housings **13** and accelerator foot pedals **14** have been molded by the million from soybean plastic at the Ford plant. Cellulose acetate, however, finds service in decorative applications in Fords, Mercurys and Lincoln Zephyrs. Fig. **15** illustrates these parts in the Ford de luxe where instrument panel, knobs and escutcheons are injection molded of this material. Fig. **16** shows the neat, simple instrument panel in the new Mercury. The newest use of acetate, and one likely to spread in many directions, is represented by the extruded door trim in the 1940 Zephyr **17.** Mounted on thin metal, two extruded acetate strips decorate each door panel and protect upholstery during opening and closing operations in service

partment to meet any reasonable production demands.

Injection molding from cellulose acetate in its early stages, largely because of limited individual machine capacity, offered narrow opportunities for a sizable automobile builder such as Ford. The pieces the earlier machines supplied were mainly ornamental trim parts or regulator escutcheons. The machines were also limited in their production capacity.

The injection machines now developed, larger in size and of greater capacity, have enabled the Ford Co. to extend the dimensions and number of plastic parts on all their models. A hasty comparison of any 1940 Ford model with any previous car will disclose innumerable new injected applications. Interesting is the large speedometer dial and meter gage instrument panel escutcheon on the current Ford de luxe. The proportions of this unsupported cellulose acetate molding are a unique technical achievement. Heretofore, deficient cold flow qualities of materials would have precluded the adoption of such a part. The escutcheon modernly styled and soundly engineered is an unusual and attractive innovation in the model.

The 1940 Mercury includes on its instrument panel one of the most comprehensive groups of injected molded thermoplastic parts ever to have been used by an automobile manufacturer. Individually these pieces are representative molded articles. Assembled they present an extremely interesting instrument panel. The sectional arrangement of the panel has made the application possible.

Departing from either compression or injection technique, Ford has inaugurated and is using in the 1940 Zephyrs a decorative interior plastic trim strip made by the extrusion or stuffing method. Cellulosic materials are extruded or stuffed by screw stuffers into continuous length profile rods. These are cut a suitable length, and then affixed to a steel back to make attractive trimming. Considerable work formerly done on various types of trim was made obsolete by the perfection of this system. In all probability this type of strip trim will be widely adopted.

The Ford plastics production process in both the manufacture of molding material and molding by either compression or injection is unique. The method of making the soybean compound, while in principle similar to parallel methods, has had to incorporate innovations in treatment that make it characteristically distinct. The machinery for all molding is standardized in so far as that is practically possible. The method of charging the injection battery by gravity from overhead is economical and facilitates material control.

Based upon the accomplished results, Ford plastics are rapidly reaching their majority. The advanced thinking in the art done by the Ford staff is provocative. One's imagination is projected to horizons ever beyond. With experimental garnish moldings meeting laboratory standard conditions, with rear deck doors doing well in field tests, with tractor seats in standard production, with other exterior applications being proved, dreams of entire bodies from plastics approach nearer to reality.

15

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17

Fresco in Frisco

by MARIE PAKE

Illuminated acrylic panels form an unusual and beautiful ceiling in this smart cocktail lounge

UNEQUALLED in power of conception and technical mastery, Michaelangelo's great painting in the Sistine Chapel has ever been the inspiration for this type of elaborate fresco ceiling decoration. But far beyond the imagination of such genius, architectural, painting and design techniques have progressed along with invention and scientific achievement. The tremendous variety of new materials, dyes and tools now available make possible utterly different and exciting creations—a new type of master craftsmanship.

In the St. Francis Hotel, San Francisco, California, the lovely illuminated ceiling of the cocktail lounge, formed of clear methyl methacrylate panels, is a stunning example of elegance of design and architectural workmanship executed in modern material. Combined with indirect lighting, the ceiling is the focus of interest, and the entire arrangement and furnishings were planned to emphasize its effect.

Restful, inviting, the handsome surroundings of the new room have an atmosphere of leisure and spaciousness—a relief from the noisy, nervous, staccato tempo of the violent crowded contemporary scene. Architect Timothy Pflueger has taken the motif of the Pacific for the decorative theme. *Pacifica*, symbol of peace, was the key-figure of the recent Golden Gate International Exposition, where the *Pageant of the Pacific* was unveiled, and a similar artistic spirit is prevalent in the plan and decoration of this lounge.

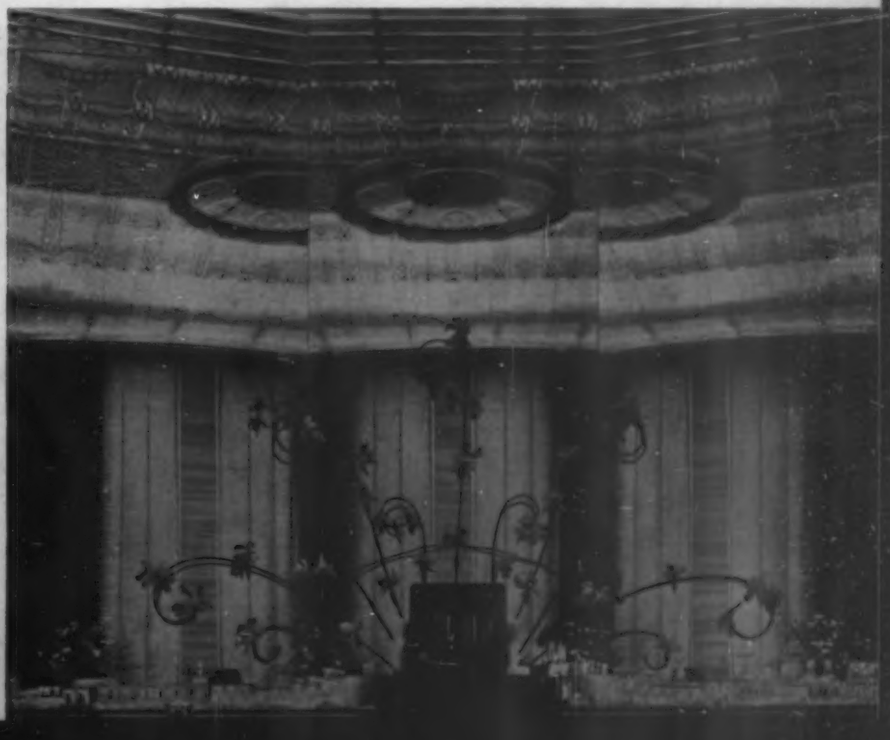
Composed of closely fitted individual blocks of plastic covering 2,000 sq. ft., combining light, decoration and

To create the illusion of motion with ever-changing colored lights, Dave Swedlow used hand-shaped, engraved Lucite panels for the ceiling in the St. Francis Hotel Cocktail Lounge pictured here. Walls are black patent leather, columns are mirrors. The bar (directly below) is Micarta. Stools are perched on Lucite rods. Details of the ceiling are reflected in the mirror back of the bar shown at right, below

ventilation, this amazing ceiling is as thrilling in its beauty alone, as it is triumphant in architectural and technical skill. Shaped in exquisite floral and symbolic designs, the methyl methacrylate panels have a sculptural depth and brilliant luster that is distinctively ornamental. The bold pattern carries out the motif of the Pacific. Mori masks, South Sea Island forms, scrolled leaves and tropical fins form the central composition with a lotus-like detail in the center. A wave pattern that ripples to the edge of the ceiling continues the rhythm around the outer fringes.

Six different type panels were used, for each of which a separate wooden mold was made. Individual panels were formed of cast acrylic sheet, shaped over the mold under heat and pressure. The backs of the sheets were then treated to give a sand-blasted effect which provides more uniform diffusion of light. Sheets were formed to a tolerance of 1/16 in., so that panels fit close.

The plastic panels are suspended by hooks below the architectural ceiling, leaving space for colored indirect lights which shimmer through the semi-transparency of the quartz-like plastic, flooding the room with changing moods. There is a space of approximately 18 in. between the architectural ceiling, which is white and the methyl methacrylate ceiling. On a level with the panels, electric lights are set in the wall in recesses about 18 in. deep. In front of each light is placed a color filter which moves continually. The lights are focussed toward the white ceiling, and then reflected back to the plastic which uniformly diffuses the light. Set in one color, in combination or used in rotation—amber to suggest sifted sunshine for luncheon guests; mother-of-pearl, for gay evenings; deep orchid and dark green for eerie or seductive contrasts—these lights lend enchantment to the room. The frosty overhead immobile masks and fanciful leaves seem to come alive with the constant flicker of color. The secret of this effect of movement and opalescence is in the plastic. The acrylic material catches, bends and transmits light waves (*Please turn to page 72*)



Machines processing nylon yarn, twist a bundle of slender filaments into a single resilient thread

I

Nylon in Production

These man-made fibers which have no counterpart in nature climax ten years of constant research

MANUFACTURE of nylon yarn in the first unit of the new du Pont plant at Seaford, Del., began on December 15. Production of the yarn, scheduled originally for early in 1940, has been advanced several weeks, due to the project being completed earlier than was anticipated when the construction work started January 20 last.

Operations will proceed gradually, gaining speed as experience develops with equipment and personnel. A single spinning machine was started last month and the product will be minutely observed and proved satisfactory before other machines are put in operation. Capacity levels probably will not be reached for several months.

The plant is the first of its kind ever built, designed to fit an operation never before undertaken. The original unit is a single building, 1052 ft. long and 272 ft. wide. Slightly irregular in shape, it is essentially an elongated, single-story rectangle, extending from a six-floor tower at one end. The roof is flat, broken by terrace-like set-backs at different elevations. Large pent-houses accommodate air-conditioning equipment, with cowls and supply ducts coiling across them.

The manufacturing process begins in the tower, reached by metal stairways. On the top level are huge insulated vessels of stainless steel. Below are other large receptacles, called autoclaves, extending through two floors of the building. Pipes, layer upon layer, line ceiling and walls, forming strange geometric patterns as they converge. On a lower level is a long line of shining metal canisters reaching from floor to ceiling. Each floor is devoted to a separate phase of the operation as the material flows downward through the crucibles of chemistry.

Electrical instruments mounted on panels guide the process with minute precision. Robot observers signal with flashing lights and chimes. Temperatures and pressures are recorded in vari-colored lines on paper disks. There are scales that print measures of weight on ticker-tapes similar to those in a stockbroker's office.

Each aspect of the performance is carefully and systematically scheduled to the split second.

On the lower levels of the tower, intricate mechanisms designated as spinning units transform the nylon flakes into the slender, web-like filaments of nylon yarn. These units are grouped in batteries of twenty, set in horizontal wells through the floor. From the top, they resemble circular flour sifters, shaped to fit into the apparatus. They are kept filled with the flake-like nylon chips by mobile hoppers, traveling along an overhead rail. Here the material is melted, then pumped under pressure through *spinnerets*—cups pierced with tiny holes. On the level below, the filaments appear, almost invisible individually as they become solid upon reaching the air. The fibers are again whisked from view down a narrow pipe-like chimney, where on the floor below they are wound on bobbins. The man-made harvest is complete as the strands spin merrily around the cylinder.

From this point, the yarn begins its progression through the various processing operations. The length of the plant is partitioned laterally into a series of long rooms, housing rows of textile machinery. Running at high speeds, these devices rotate spools and bobbins. The batteries of machines stand row on row along long aisles, the regimented ranks of modern industry. Their mission is to twist and otherwise prepare the product for industrial purposes.

After a *pre-twisting* to facilitate handling, the bundle of fibers is drawn or stretched to impart the strength and elasticity peculiar to nylon. This is accomplished by a machine which stretches the yarn between two rotating devices going at different speeds. Chemists characterize this process as a rearrangement of the nylon molecules in an orderly, length-wise array, rather than in helter-skelter fashion like individual straws in a hay stack.

The yarn is then twisted and given a *size* and lubricant in preparation for knitting and weaving. After final inspection it is packaged in skeins, cones or other forms and delivered to the shipping room at the building's extreme end, where a loading platform parallels the railroad tracks.

Longitudinally, the plant is bisected by a corridor separating the manufacturing from the service section. This area provides quarters for store rooms, machine shops, a control laboratory, supervisory offices, locker rooms and a cafeteria.

The air-conditioning plant is one of the most modern industrial systems of its type (*Please turn to page 72*)

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2 For fishing enthusiasts—line and leader made of nylon monofilament require no moistening, have less sheen under water than gut, do not fray, split or become brittle. **3** Sanitary, tough Exton tooth brush bristles absorb less moisture than natural bristle. **4** Dainty sheer hosiery, spun from these strong, resilient fibers, dries rapidly and wears and wears and wears

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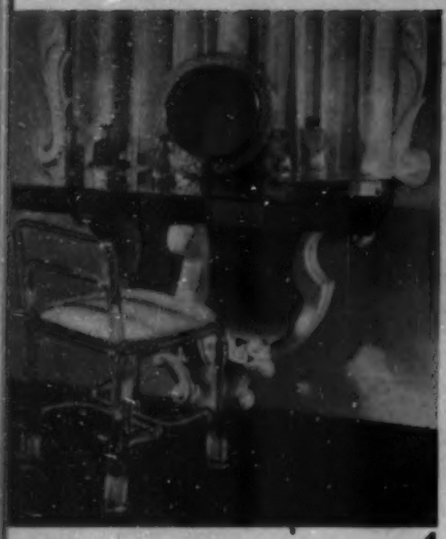

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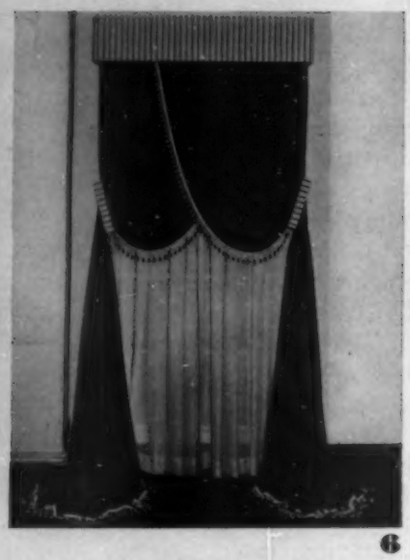

6

Decorative Accessories

1 Trimmed with velvet and tied with cord in Empire style, a soft blue Lumarith Clair de Lune shade completes the porcelain lamp ensemble. The smooth translucent surface cleans easily, retaining color and finish.

2 Utilitarian luggage rack of clear Lucite is a decorative asset in any guest room. Lightweight, the rack, fitted with two tapes across the top, can be folded to fit the average closet

3 Space-saving Circulair serves as ash tray, cocktail table, and cooling unit. An electric fan for air control is hidden in the base. A Daystrom Bakelite laminated surface protects the top from wear and is not harmed by spilled drinks

4 For Baroque or modern settings, Swedlow-Lehman designed this crepe-upholstered boudoir chair, fashioned from Lucite. Two curved rods forming the legs and back are made structurally sound by an ornamental wrap-around of smaller plastic rods. Stretchers, bent to strengthen the chair and complete an interesting pattern terminate on the floor as part of each chair leg. Available in New York from W. & J. Sloane.

5 A unique optical effect is obtained in this transparent Plexiglas cigaret box by the use of a magnifying top section. A relatively air-tight joint between cover and base retains moisture in the cigarets. Designed by Gilbert Rohde, it is not yet in production

6 Colorful drapery cornices and fittings, to match contemporary or period interiors, are made of Lumarith by Kirsch & Co., Inc. Practically unbreakable and chip-proof, they are permanent in finish and can be cleaned by wiping with a damp cloth

7 Hand-tinted, cork-backed lithographs, surfaced with cellulose acetate sheet by Mor-Gan Laminating and Foliating Co., add variety to the luncheon table. Mats are available in several popular prints from Fallani & Cohn

8 Smartly designed bookends, solid, yet bright with reflected light, were cast of Plexiglas by C. K. Castaing Studio.

9 Graceful, crystal-like tie-back for soft draperies will not detract from color or pattern interest. Designed by Gilbert Rohde, it is formed of flat Plexiglas sheets, bent into shape under heat

10 Novachord is a novel electrical instrument which can produce a variety of musical effects. Laurens Hammond, its creator, selected Bakelite phenolic for the panel board, black keys and the 13 controls with which the tone is varied. Plaskon replaces conventional ivory for the white keys

11 Soft, diffused indirect light from small, clear, low cost bulbs, is refracted through engraved Plexiglas parts of stylized, ornamental lamps. Marblette bases in black or white contrast with the crystal acrylic. Designed and produced by Castaing Studio

12 No flints, no wheels, no working parts to go wrong—the Mystic Torch table lighter is almost foolproof. Handsome case, concealing batteries, is molded of Lumarith and Monsanto cellulose acetate by Watertown Mfg. Co. A cast resin knob tops the lighting unit—a brass bar holding the wick. When the wick is inserted in the slot a spark from the batteries ignites the lighting fluid

For manufacturers' addresses write the Editor, enclosing stamped envelope for reply

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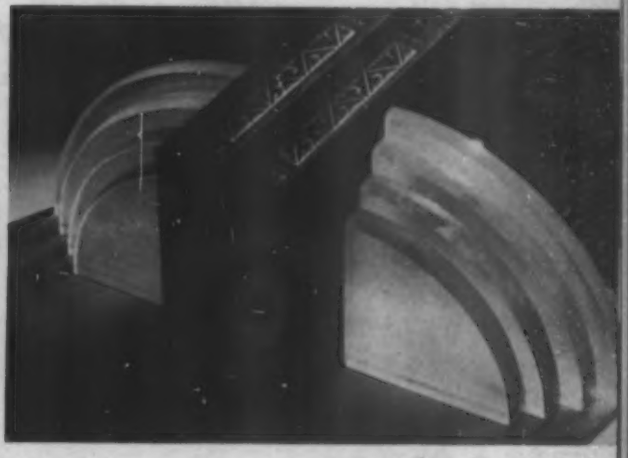

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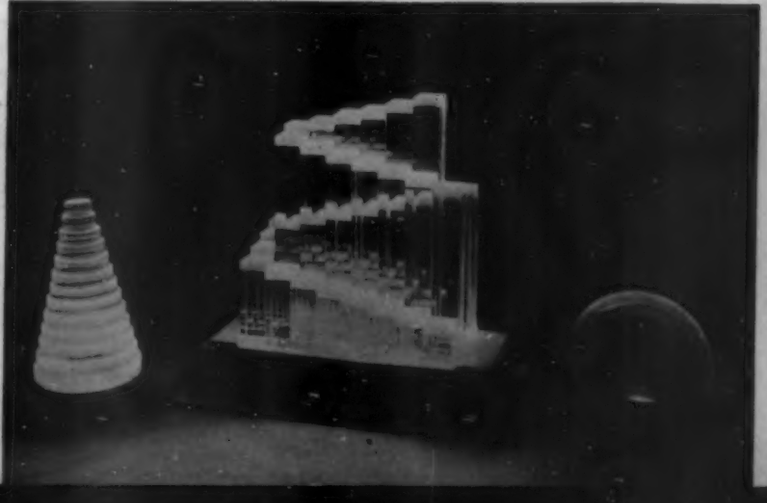

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13 The old-fashioned washboard goes modern. Small but efficient, the Molly-O board is light, noiseless and unaffected by soap. Molded of Bakelite by American Molding Co. Convenient for travel, it is handy for use in small apartments

14 For brighter breakfasts, dripless serving pitchers are capped with colored tops, injection molded of Tenite II by Chicago Die Mold Mfg. Co. for Federal Tool Corp. These non-tarnishing plastic closures have a quick cut-off device for dispensing heavy liquids without spilling

15 Sanitary faucet "spa" filters water by removing dirt and all suspended particles through cellulose fiber disks. Easily accessible for cleaning, disks are housed in rust- and corrosion-proof Bakelite molded. Constructed by Automatic Water Filter Company

16 Pressed for time? Miniature, open-jawed electrical device of the Cole-Toomey Co., Inc., conveniently presses clothes without delay. No moisture or pressure is needed and there is no danger of overheating. Molded Bakelite housing is heat-insulated

17 Designed for heavy duty, the Hamilton Beach fruit juice extractor has a molded Bakelite drip cup and funnel, made by Eclipse Moulded Products Co. A combination plastic Rogers Board strip and ring at the base give extra strength to the collar of the funnel, which takes up part of the 1000 lb. pressure exerted by a downward push of the handle. The ribs on the outside surface of the funnel fit tightly into grooves in the metal bowl

18 Tea brewing on an exact scale—In the Silex Tea Maker, water boiled in the lower bowl is forced up through a strong, light molded Durez spray tube, raising a check ball at the top, and is released through small holes. The spray thoroughly saturates the leaves which have ample room for expansion in the upper bowl

19 Concentrating light just where you need it, the adjustable Nite Beam bed lamp has a heavy glass magnifying lens to intensify the light. Two-piece bullet-shaped reflector in pastel shades of Beetle, walnut Durez and Bakelite, is molded by Jos. Stokes Rubber Co. for Eagle Electric Mfg. Co. Heavy clamp is felt-lined to prevent marring

20 Harmonizing with interior colors, the Diehl Mfg. Co. electric fan is molded of Bakelite in black, brown, blue and red. Ribbons to match or contrast with the molded base and body replace the usual rigid blades

21 Redesigned by Barnes & Reinecke, the new 2-slice Toastmaster has base, handles and indicator of Bakelite, molded by Reynolds Mfg. Co. Identifying nameplate in handle is metal strip insert

22 For well-groomed closets, washable Lumarith Celotags to tie up lingerie or lines, will outlast the ribbon bands that come with them

23 Take your radio to bed and catch up in your reading, too. Easy to clamp overhead, Lullaby radio and built-in bed lamp is housed in a brown mottle Durez cabinet, molded by International Molded Plastics, Inc. for Mitchell Mfg. Company

24 Reviving the family server, Tappit Kruette salad dressing dispensers set on a caster tray, designed by Food Dispenser Co. Molded parts are of Durez in black and red, and ivory Beetle. Names of food products are imprinted on the molded bases

For manufacturers' addresses write the Editor, enclosing stamped envelope for reply

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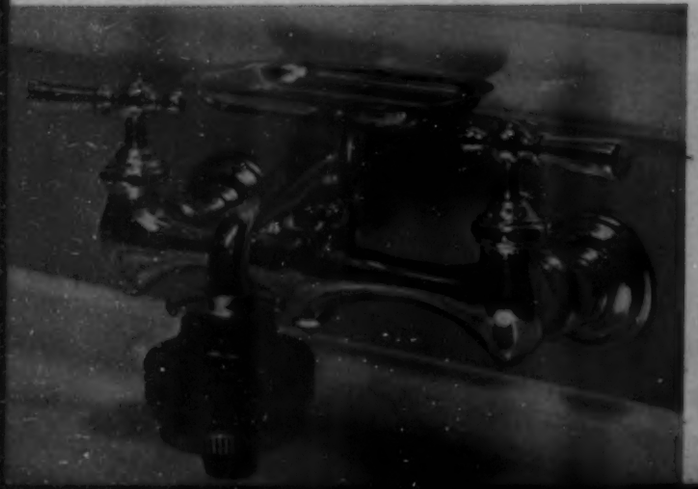

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Smart Home Equipment

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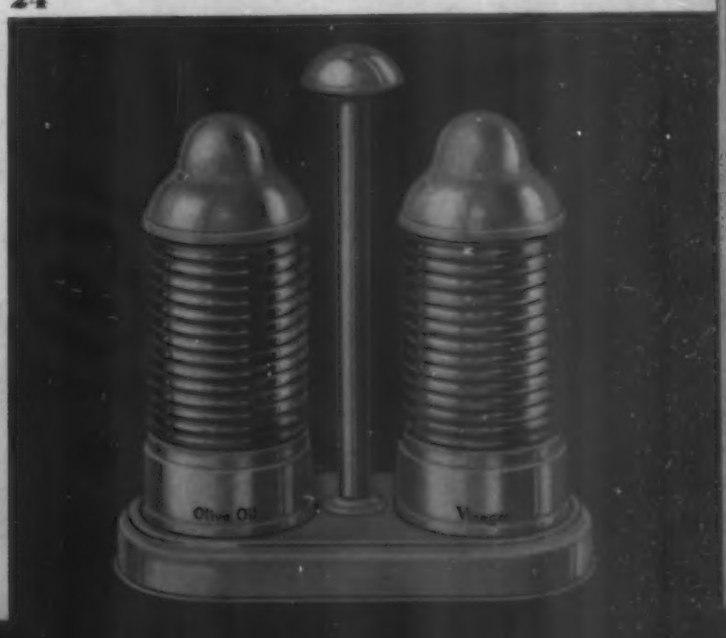

a Modern Stage for

YOU SEE THEM EVERYWHERE . . . these smart, modern, new General Electric Radios.

That's because they've hit the public fancy . . . hit it hard, to the tune of hundreds of thousands of units sold in a short time.

General Electric Radio performance in itself is a big selling factor. And when you combine mechanical excellence with eye-striking appeal, *you've got an unbeatable salesmaker!*

The General Electric Radio cabinets shown here are Molded Plaskon. They are outstanding examples of the adaptability of this plastic material to intricate designs and patterns. Note the flutings, the integral louvres, the variations in planes, the bases, the size of these one-piece cabinets . . . all these features strikingly demonstrate the practical advantages of Molded Plaskon.

Molded Plaskon is smooth and warm to the touch. Though light in weight, it has great strength—will not chip, corrode, rust, or tarnish. Its surface is hard, easy to keep clean. Water, oils and organic solvents will not stain or otherwise affect the beauty of Molded Plaskon. Being solid molded color, the finish is permanent. Neither scratching nor abrasion impair its color value.

These are but a few of the many distinctive qualities that have made Plaskon the world's largest selling urea-formaldehyde plastic—and one of the most versatile.

Buttons and buckles . . . bottle caps . . . cosmetic containers . . . handles, knobs and dials for motor cars, radios, electrical appliances . . . lighting reflectors . . . switch plates and other electrical wiring devices . . . toys and novelties . . . these represent only a fraction of the wide variety of applications to which Plaskon has been adapted successfully and with profit.

Ask us for suggestions on how Molded Plaskon may be able to give *your* product new shelf appeal, eye appeal, *sales appeal!* A letter or wire will bring a Plaskon representative quickly.

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2121 SYLVAN AVE. TOLEDO, OHIO
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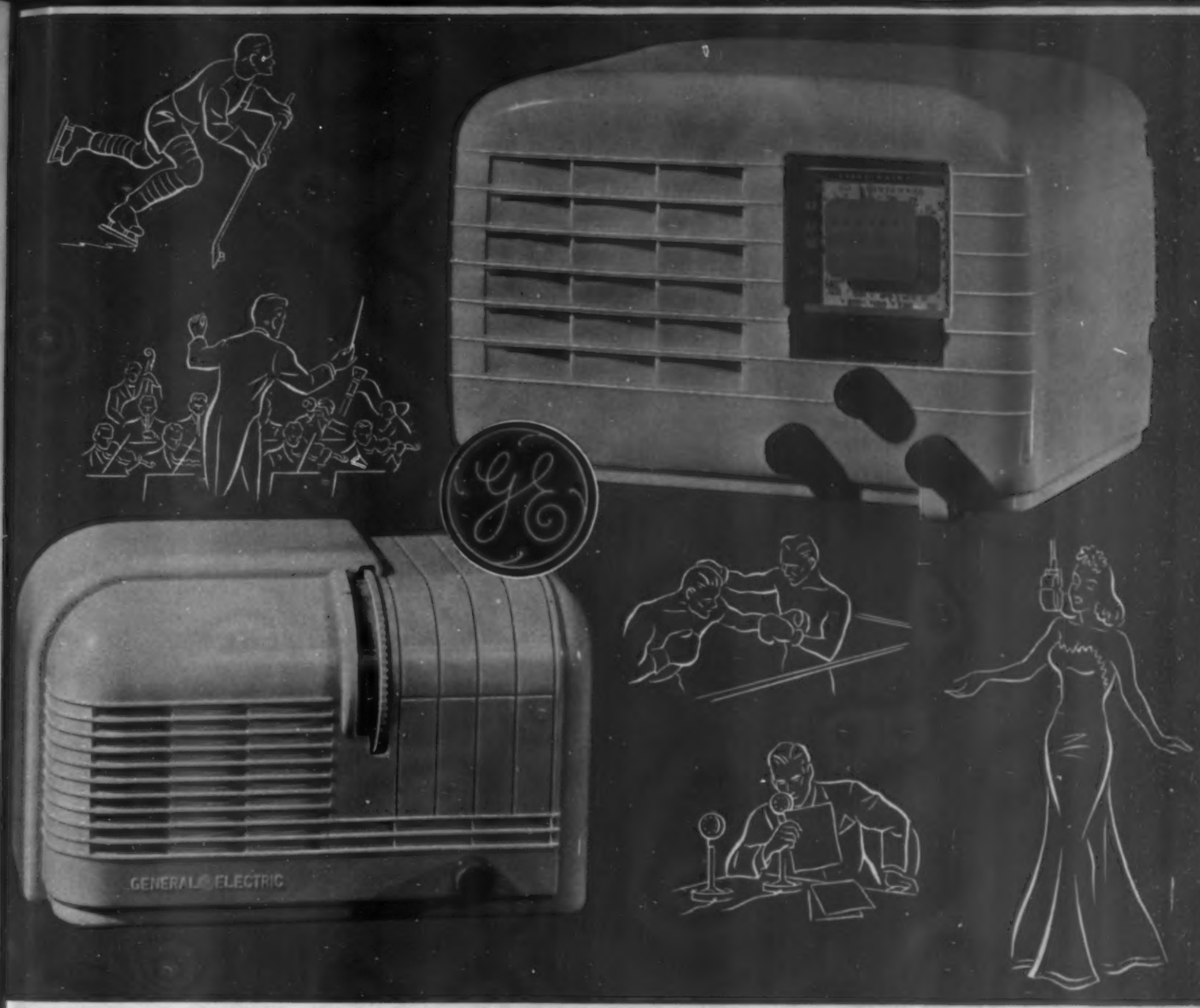
Your Favorite Stars



These are the striking, eye-catching radio cabinets molded from Plaskon by the Plastics Department of the General Electric Co. The upper cabinet is 7¼" high, 10¼" wide, and 6⅜" deep. Weight 32 oz. The lower cabinet is 5⅞" high, 9⅛" wide, and 4⅜" deep. Weight 22½ oz. Note the integral louvre design, made possible by the easy-molding features of Plaskon.

Trade Mark Registered

PLASKON

★ MOLDED COLOR ★

The World We Make

by W. S. ROSS

Sydney Kingsley's current hit at the Guild Theatre (N. Y.) depends upon translucent and transparent plastics for some of its scenic effects

CONSIDERATIONS impelling the use of plastics theatre-wise are, naturally, different from those of industry. Lightness, low breakage, controlled reflection, controlled transparency are plastic qualities which answer definite problems of scene designing.

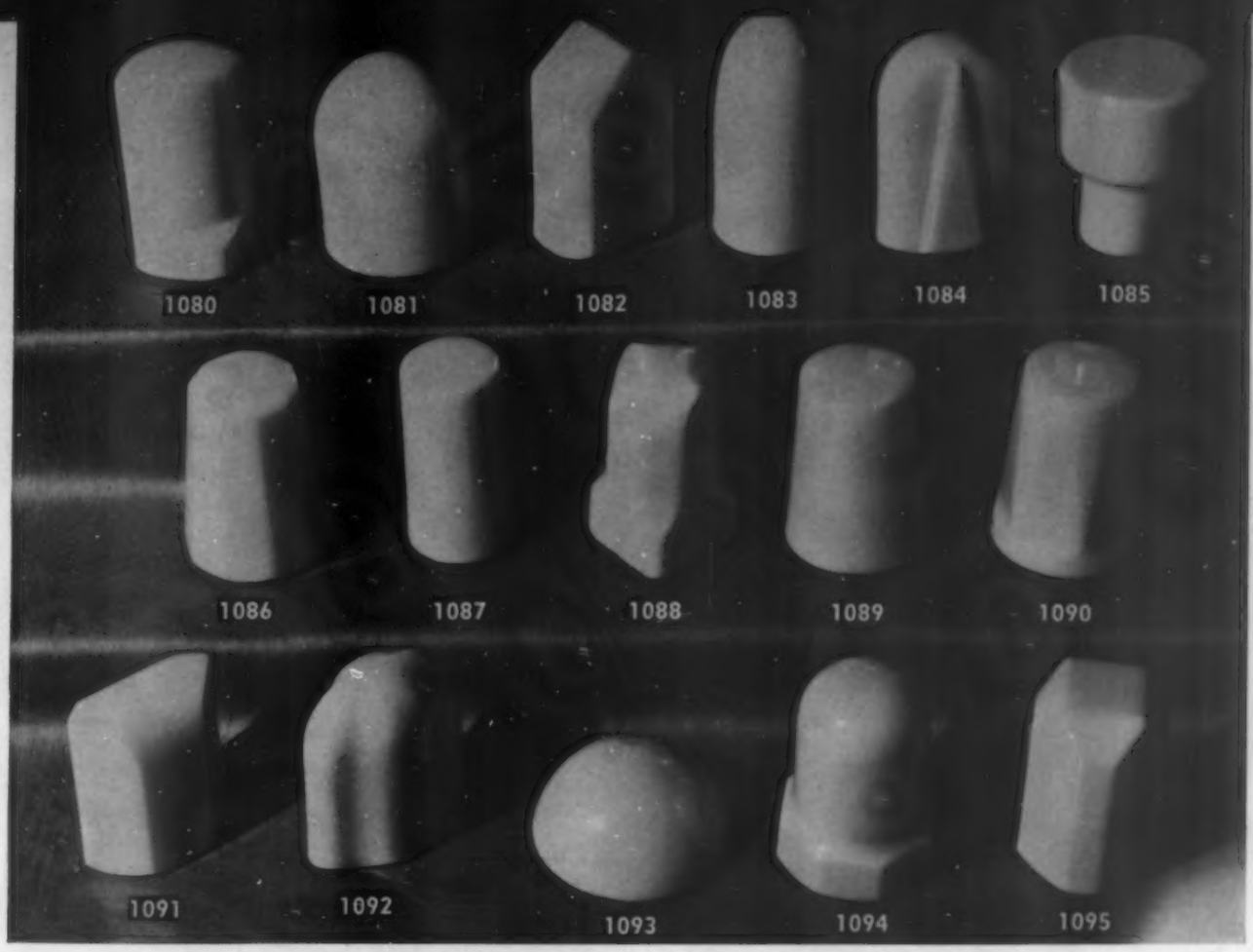
All these considerations, plus certain functional problems of the play being set, caused Harry Horner, scene designer, to specify translucent laminates—available in stock sheets—in *The World We Make.* Glass is rarely if ever used in the theatre. When the effect of a hospital with glass walls was desired, in the first scene, Studio Alliance, scene builders, hit on opal laminate, therefore, as possessing the requisite degree of translucency. Behind this screen, moving shadows produce an illusion of hospital activity.

Stock sheets of the plastic were cut to size, drilled, and nailed to wooden frames. Breakage has been nil, except in the transportation of the set to the theatre, when truckmen kicked through one or two sheets. Stagehands are pleased with the lightness of the set, which they must shift at least once each day.

Reflection must be avoided at all costs in building scenery. For a reflecting material will show all the wires, pulleys, ropes, etc., that make up the backstage and destroy all the illusion of reality the designer and scene-builder have labored to create. So, in *The World We Make,* cellulose acetate sheet was used wherever a transparent material was called for.

The material plays an integral part in the action of the play. For, as the play opens with this scene, the main character, Virginia McKay (played by Margo), is an inmate of this mental hospital—a victim of functional insanity. Toward the end of the scene, she steals the key that permits her to escape. And her escape is shown in shadow, first, by the opening of one door, then another, and finally her shadow growing larger and larger, blots out the square of light, leaving the scene in total darkness—as the curtain falls.

Creating the effect of action beyond the audience's range of vision, shadows backstage move behind a translucent Lamicoid wall. Plastacele sheets were used wherever non-reflecting transparent material was required



Sheets One to Fifty-Two, reprinted in book form, twenty-five cents in coin or stamps

Cast Resin Forms

SHEET NINETY-ONE

Suitable for a variety of applications such as umbrella handles, knobs, decorative tops, these cast resin forms are available from stock. Various degrees of translucency and a wide range of colors are obtainable. Drilling, tapping, threading makes possible easy fastening. Address Stock Mold Dept., giving item and sheet numbers

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1080. Oval top handle with 1 in. square base; 2 1/4 in. high. Weight is 1.3 lbs. per dozen

1081. Round tapering handle, 2 3/16 in. high. Diameter of base, 1 1/8 in. Weight is 2 lbs. per dozen

1082. Ridged octagonal handle, 2 1/8 in. high. Weight per dozen, 1.5 lbs. Diameter of base 1 3/16 in. by 1 1/16 in. wide

1083. Round tapering handle, 2 7/16 in. high. Weight per dozen, 1.4 lbs. Diameter of base, 1 1/8 inches

1084. Handle with center ridge, 2 1/4 in. high. Weight per dozen, 1.4 lbs. Diameter of base, 1 1/4 in. by 11/16 in. wide

1085. Round handle, 1 15/16 in. high. Weight per dozen, 1.2 lbs. Diameter of base, 13/16 in. Diameter of top, 1 1/2 inches

1086. Ridged round tapering handle, 2 in. high. Weight per dozen, 1.4 lbs. Diameter base, 1 3/8 in.; 1 in. top

1087. Plain round tapering handle, 2 in. high. Weight per dozen, 1 lb. Diameter of base, 1 in. Diameter of top, 7/8 inch

1088. Ridged handle with 1 in. square base; 2 3/16 in. high. Weight is 1.2 lbs. per dozen

1089. Plain round tapering handle, 2 in. high. Weight per dozen, 1.5 lbs. Diameter of base, 1 3/8 in. Diameter of top, 1 1/16 inches

1090. Ridged round tapering handle, 2 in. high. Weight per dozen, 1.4 lbs. Diameter of base, 1 5/16 in. Diameter of top, 1 1/16 inches

1091. Hexagonal handle, 1 7/8 in. high. Weight per dozen, 1.1 lbs. Diameter base, 1 1/4 in. by 7/8 inches

1092. Hexagonal curved handle, 2 in. high. Weight per dozen, 1.2 lbs. Base, 1 7/16 in. by 7/8 inches

1093. Half-globe handle, 1 3/4 in. high. Weight per dozen, 1 lb. Diameter of base, 1 3/4 inches

1094. Round handle with octagonal ridged base, 1 1/4 in. in diameter. Height is 2 1/16 in. Weight is 1.35 lbs. per dozen

1095. Hexagonal ridged handle, 1 15/16 in. high. Weight per dozen, 1.2 lbs. 15/16 in. diameter of base

A TRIUMPH OF

GOOD TASTE

...molded in DUREZ!

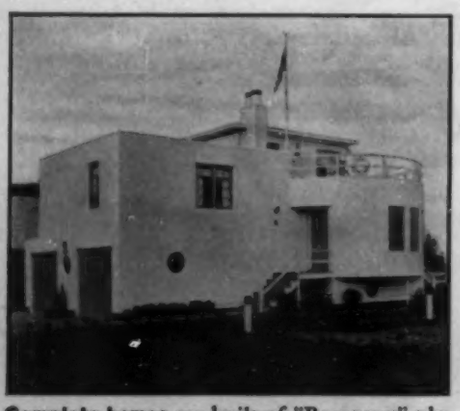
New Cafex Vacuum Coffee Maker with a one-piece upper bowl of special molded Durez plastics.

A SIGNAL ACHIEVEMENT with Durez plastics, has recently been made by the Hartford Products Corp., manufacturers of Cafex Vacuum Coffee Makers. This is an upper bowl molded entirely of Durez!

This one-piece molding is almost unbreakable—a feature of great advantage in vacuum coffee makers. But more important, it is as impervious to taste and flavor as glass. Tests made by a leading engineering laboratory and a noted magazine research department prove conclusively that this molded Durez bowl has no effect whatever on the flavor of coffee—that the compound is insoluble in hot water—and that no odor is developed by use of bowl in brewing coffee!

Here is an unusual application of Durez plastics which might readily suggest a whole new field of possibilities to the manufacturer and molder. Surely, it shows that there is almost no limit to the scope of these versatile plastics. If you would like more information about this unique application just write Durez Plastics & Chemicals, Inc., 581 Walck Road, No. Tonawanda, N. Y.

Special Durez resins have been developed for adhesives of many kinds. They produce a strong bond, with high resistance to oils, soaps, mild acids and alkalis.



Complete homes are built of "Resnprest" plywood which is Durez bonded because the Durez glue-line is waterproof and resistant to termite fungus and mold growth.

Grinding wheels made with Durez resins as a bond can be operated safely at higher speeds, consequently cut faster. Toughness of these resins insures longer wear.

DUREZ PLASTICS & CHEMICALS, INC.

PLASTICS THAT FIT THE JOB

Technical Section

PLASTICS PROGRESS DURING 1939

PURSUING a precedent set last year the Technical Section of this first issue of 1940 is devoted to a survey of advances in the technology of materials and processes in the plastics industry during the past twelve months. The reports which follow have been prepared by well-known chemists and engineers who have had an active part in the developments which they describe. Their ready cooperation in assembling this information is gratefully acknowledged.

This survey would take on added significance if it were possible to compare it with a similar review prepared at the beginning of the '30s. The phenolic and pyroxylin materials were the alpha and the omega of the industry in this country at that time with only one or two hints of the multifarious things to come. Then in rapid succession came the successful production and utilization of urea-formaldehyde compression molding powders, cellulose acetate injection molding materials, chemically resistant vinyl resins, glass-clear acrylic and styrene resins, ethyl cellulose, lignin plastics, cellulose mixed esters, and within the past month, methyl cellulose. The molding sector of the industry has contributed its share of new developments in the rapid perfection of the injection molding process and in the present zealous activity in the automatic molding field. The applications and markets for plastics have been tremendously expanded by these accomplishments of the past ten years. The articles in this issue covering developments in the year 1939 are an account of a New World as compared with the plastics sphere of 1929.

These rambling thoughts have been largely confined to retrospection. What of the future as a new decade lies before us? The '40s of the last century stand out vividly as a period of industrial expansion in the history of our country and as the years marking the discovery of gold in "them thar hills." The potentialities inherent in the new plastics and in the improved tools that have been developed for fabricating them provide good reasons to believe that the '40s of this century will mark a golden decade for the plastics industry. G. M. K

Molding Presses

by GEORGE K. SCRIBNER

BOONTON MOLDING CO.

FOR the first fifteen years after the discovery of Bakelite created the present-day molding industry, its operating technique was based on hand molds, opened, closed and loaded on the bench and placed in a small hydraulic press for the application of heat and pressure. Then someone discovered that instead of pulling the mold apart on a separate arbor press it could be done in the molding machine itself by the addition of power push backs and clamping the mold parts to the top of the press and the moving ram. Presses changed but little in the process, merely grew bigger and a bit more complicated as a result of the more intricate knock-out mechanisms which were required to get the piece out of the mold.

The next step was the addition of automatic valves controlled by electric clock mechanisms that allowed the operator, by pushing a button, to close the press on low pressure, turn on the high and open again on a predetermined schedule. Sometimes these would regulate steam and water to heat and chill the mold. These valves came over from the rubber industry where line pressures were not as high and cycles as fast as phenolics and ureas called for. The result was not so happy and very few of them were successful. The constant shift from job to job with change in timing requirements was an added obstacle to their smooth working.

With the successful compounding of moldable cellulose acetate the fully automatic injection machine originally developed in Europe became popular and, when American manufacturers took it over, a really automatic production mechanism was evolved. Early attempts had plenty of faults but today these machines can be relied on safely for 24-hour operation.

The absence of a really reliable sturdy hydraulic valve that could be easily timed and regulated was the basic reason for the delay in bringing out fully automatic thermosetting molding presses.

For some unknown reason during 1939 at least eight fully automatic phenolic and urea presses hit the front page together. Most of them are limited to certain sizes and shapes of pieces, few of them do a complete job from drum of raw material to the finished piece, but considering their age, they all show promise of going places in the near future. (*Please turn to next page*)

F. J. Stokes Machine Co. of Philadelphia has contributed two machines. One is the small 15- or 25-ton electric drive with powder feed for small parts. The other is the Standard, with a more conventional press having two molds sliding in and out of the press at right angles to each other, the one being pressed and cured while the other is cleaned and loaded.

Owens-Illinois has developed the Lauterbach, a rotary press modeled basically on the rotary pill presses in common use but carrying individual hydraulic cylinders under each station, operated from a central power well and completing the loading, curing and unloading of each station in one revolution. This machine is also powder fed.

C. D. Shaw of Detroit has adapted the thermoplastic injection type machine to thermosetting materials. His problem has been time and heat control plus rigidity of construction to withstand the high molding pressures which are required.

Watson Stillman has worked out a side ram press that ejects by splitting the mold.

Boonton has adopted the standard press, mold and molding operation and has solved the problem by doing all the ordinary operations including preforming and preheating by mechanical means.

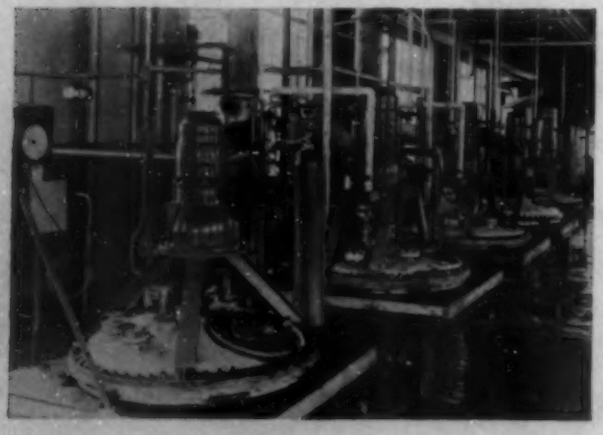
Hartford-Empire is working out a full mechanization of the Shaw Insulator Co. transfer process which would be somewhat akin to modern glass molding in its basic principles. Nothing has come from them as yet to hint at their exact angle of approach.

Another molder has developed a cube mold which exposes two sides to the loading and unloading operation while the other two sides of the mold are under pressure and heat.

These are only the known lines of attack on the most fascinating problem of the present molding industry. The advantages of controlled molding lie not alone in the reduction of labor costs although this is not to be thrown aside lightly. More pieces per hour per cavity mean less tool investment for a given output. Exact timing means greater uniformity of dimension and general characteristics. Thorough preheating means greater strength and higher mechanical, chemical and electrical standards. The elimination of the human hand permits the designer and engineer to plan and do as it ought to be done.

Today these fully automatic presses are not operating in quantity but it will not be long before they dominate the market for plastics. When they do we will have really come of age.

This top floor view shows a battery of huge resin kettles which produce alkyd resins for coatings



Coatings

by W. T. PEARCE
THE RESINOUS PRODUCTS & CHEMICAL CO., INC.

MANY distinctive finishes were introduced during the year. Automobile enamels containing urea-formaldehyde resins were adopted in order to secure greater hardness, mar-proofness, water resistance and durability. Low baking urea-formaldehyde finishes were offered to furniture manufacturers. These will shorten baking schedules. They are forced dried at 140 deg. to 150 deg. F. for one and one-half to two hours. Progress has been made in the application and formulation of hot spray nitrocellulose lacquers,[1] which contain as high as forty percent solids. One double coat is equivalent to four coats of the type of lacquers in general use, thus greatly reducing the time schedules which now prevail. Many interesting uses were found for acrylic resins.[2,3] Fume-proof enamels, rubber and artificial leather finishes, high baking enamels of excellent color retention, and many specialty coatings are being made with these resins.

Due to the high price and reduced supply of tung oil, greater quantities of special types of phenol-formaldehyde were employed with linseed, perilla, oiticica and dehydrated castor oils in the formulation of fast drying varnishes and enamels.

Alkyd resins were more widely employed due to improvements in the resins, and more skillful formulation. Important uses included architectural and marine enamels, mill white paints, truck and automobile enamels and metal decorating finishes.

Significant improvements were made in urea-formaldehyde resins. Their use was considerably extended, especially as coatings for washing machines, electric refrigerators and metal furniture, where hardness and resistance to marring, and to water, greases and alcohol are desired. They were employed in increasing quantity to improve the mar-proofness and chemical resistance of alkyd finishes. During the year, resins of this type in higher boiling alcohols were offered for use with varnishes to make hard mar-resistant baking enamels at lower costs.

Considerable research has been done to produce urea-formaldehyde resins which will cure at lower temperatures, and some progress was reported during the year. As a result, finishes were introduced which give satisfactory films at lower baking temperatures. Substantial reductions in price aided in their greater use.

Several years ago, one company introduced alkyd resin emulsions for interior and exterior paints, especially suitable for plaster, stucco and other porous surfaces. Patents have been granted for such materials.[4] The use of these emulsions expanded considerably during the year. They were widely and successfully used in paints applied to the interiors and exteriors of many large buildings at the New York World's Fair.

The use of vinyl resins continued to increase. A development of some importance was the announcement of the use of polyvinyl formal as a wire coating.[5] Ethyl cellulose was more widely used and further increases are indicated. The work on soybean proteins is worth noting. Emulsions of this product are of interest in the manufacture of paper coatings, because of desirable characteristics and low cost.

Important work on the evaluation of nitrocellulose lacquer solvents was reported, which included a study of toluene dilution on the solvency of several esters.[6]

Important information concerning phthalocyanine pigments was published by Dahlen.[7] A very interesting and valuable study of the factors affecting the peeling of paint on houses was made,[8] which included structural details, effects of impermeable moisture barrier and blocking of internal air circulation.

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Cellulose Esters

by HAROLD K. HAVILAND

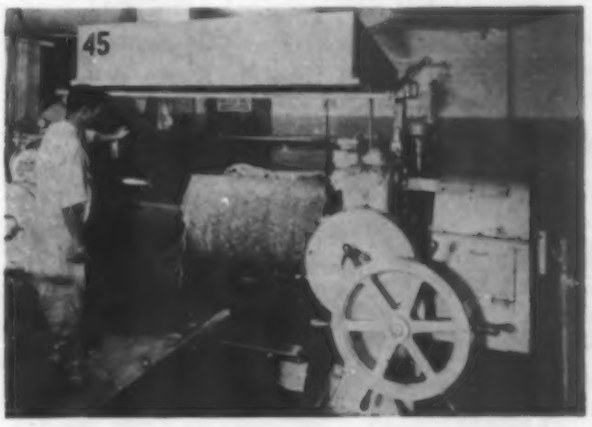
CELLULOID CORP.

CELLULOSE ester plastics during 1939 have experienced a steady, healthy development and growth. While little research has been conducted on cellulose nitrate,[1] it still enjoys supremacy in several fields because of its great toughness, water resistance, unlimited decorative effects and versatility of fabricating methods.[2] A few applications are decorative fountain pens, tooth brush handles and blown novelties.

Production of and uses for cellulose acetate[3] continue to expand at a rapid pace. The automotive industry[4] consumes increasing amounts, as the acetate plastic has become universally adopted for most of the interior hardware and appointments.

A notable achievement of the year has been the development of new formulations of cellulose acetate which are odorless, have lower moisture absorption and greater resistance to boiling water and to warpage at elevated temperatures and high humidity than previous acetates. Some of these formulations have withstood boiling water for one hour and molded articles have not warped after exposure to 100 percent humidity for 100 hours at temperatures up to 140 deg. F. Such materials have found use in the trade in such applications as refrigerator parts, kitchen utensils which must withstand hot dish water, automobile panels and garnish moldings, surgical appliances requiring sterilization, radio bezels, gas masks, bathroom fixtures, soap dishes, tooth brushes and many others. The new materials have molding characteristics similar to regular acetates. They give a fine mold finish and have good setting and excellent welding properties.

The economical volume production method of injection molding[5] is creating an ever-growing market in the toy and games industry.[6] The strength, toughness and colorability of cellulose acetate renders an invaluable sales appeal to these articles. Multi-cylinder injection machines[7] having capacities up to 36 oz. per shot are turning out such articles as automobile window reveals, toilet seats and other large items. In the field of sports interesting new items have appeared such as gun stocks, trigger guards, pistol grips and hunting knife handles. In all fields of activities innumerable new articles, large and small, are to be found.



In the production of cellulose molding powder, the filtered plastic mass is manipulated between converting rolls to homogenize and effect better dispersion of ingredients and colors. (Photo, courtesy Celluloid Corp.)

Applications for cellulose acetate sheets and films, while not so numerous as for molding powder, are showing substantial gains. Military preparedness activities are demanding large quantities of sheet stock for aircraft cockpit enclosures, inspection windows and drafting and map-making materials. A recent application is for gas mask eye-pieces which are resistant to shock and also to mustard gas. In the guide card industry the trend is now away from cellulose nitrate to the acetate. Acetate windows for storm sash, hot and cold bed frames, solarium enclosures have become within the past year an established fact in many rural communities. Large advertising billboards, made of transparent sheeting, with illuminated scenes in action have appeared on the West Coast. Consumer demand for a preview of goods to be bought has pushed trans-

parent containers to a new high level. In the electrical industry laminated slot insulation paper for motors[8] and direct winding of wire with thin foils are new applications. The high breakdown voltage and insulation resistance of cellulose acetate even at high humidities and elevated temperatures permits the use of thin foils.

The newest member of the group, which has been offered to the trade within the past year and a half, is cellulose acetate butyrate.[9] Because of its low moisture absorption, approaching that of cellulose nitrate, and resistance to varying conditions of humidity, it is finding increasing use in applications subject to outdoor exposure such as automobile tail-light lenses, auto emblems and fishing paraphernalia, and in applications subject to conditions of high humidity such as interior refrigerator parts. Cellulose acetate butyrate is now available in several degrees of flow for molding by compression and injection.

The rapid expansion in the utilization of cellulose ester plastics is a testimonial to the achievements of the research and development departments of raw material suppliers and plastic manufacturers. Patent literature reveals new methods of treating cellulose for esterification[10] and improved processes in manufacture of cellulose esters.[11] The search for the ideal plasticizer[12] continues. Several new ones are reported but few find commercial acceptance for economical or other reasons. New methods of plastifying cellulose esters are claimed.[13] Recent patents also show improvements made in extruding plastics in continuous sheets.[14] As color is an outstanding quality of cellulose ester plastics, new methods of producing multicolored and variegated sheets[15] and molded articles[16] are expected.

Aside from the progress disclosed in the patent literature, much has been accomplished in classifying formulations of molding materials into types and definite degrees of flow or plasticity having known physical characteristics, so that the most appropriate material and method of fabrication may be more readily selected for a particular application. This alone has proved of service to molders of cellulose plastics.

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Cellulose Ethers

by S. L. BASS and A. E. YOUNG

DOW CHEMICAL CO

ADVANCES in the technology of the water-insoluble cellulose ethers in 1939 are centered around ethyl cellulose as a basic material for coating compositions, films and plastics.

Manufacturing facilities for ethyl cellulose were expanded by domestic producers during the year to take care of the increased demand for this versatile product. New low viscosity types were made to permit the production of higher solids content lacquers and varnishes.

Coating compositions

Applications of ethyl cellulose in the field of coatings have continued to utilize its unusual combination of properties. Thermoplastic coatings for paper, more familiarly known as *hot melts*, can be applied without the use of solvents.[1] Ethyl cellulose was recognized as a superior base material in this type of coating because of its thermal stability and compatibility with a wide variety of resins and plasticizers. Varnishes of improved *through drying* and toughness were obtained either when ethyl cellulose was cut in[2] or cooked in.[3]

The brittleness of films from low viscosity types of nitrocellulose can be overcome by incorporating ethyl cellulose in the coating.[4] Two more ethyl cellulose coatings for preventing contamination of hot concentrated caustic by metals were described.[5]

An ingenious method of tipping cigarets and binding the loose strands of tobacco in the end utilized the non-toxic and slow burning qualities of ethyl cellulose.[6]

Ethyl cellulose lacquer emulsions were described as useful textile sizes to produce stiffened finishes.[7] A spraying lacquer of ethyl cellulose to prevent offset of freshly printed surfaces was developed.[8] The possibilities of ethyl cellulose lacquers for leather finishes were pointed out as depending upon its inherent flexibility and toughness.[9]

Films

A study of the insulating qualities of ethyl cellulose films was reported in MODERN PLASTICS.[10] Electrolytic condensers made with ethyl cellulose films were patented in England.[11]

Pigment dispersion

Ethyl cellulose, rendered plastic by working on a two-roll compounding mill, can be used to disperse refractory pigments with the aid of a metallic soap.[12] The proportion of pigment that can be dispersed and *wetted* by the ethyl cellulose increases in about the same order as the oil absorption value of the pigment decreases.[13]

Plastics

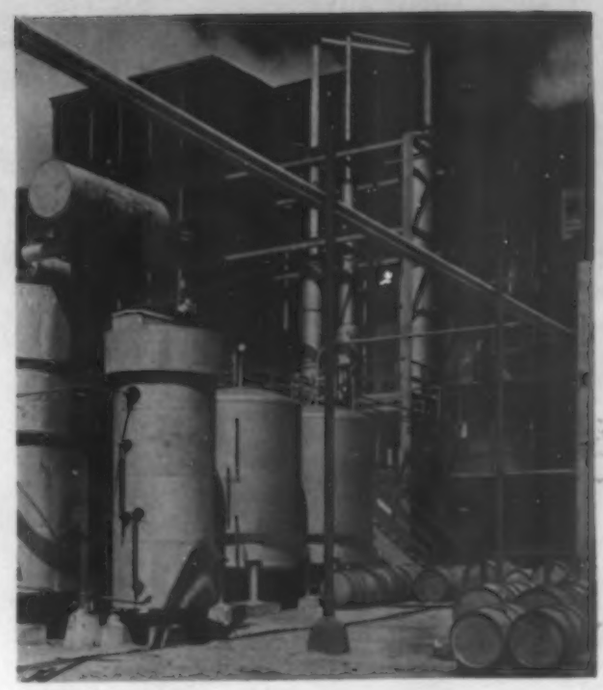
The suitability of ethyl cellulose plastics for extrusion coating of wire and for injection molding was reviewed.[14] The ease of injection molding and the toughness of commercial ethyl cellulose plastics was demonstrated at the Exposition of Chemical Industries in New York.

The compatibility of ethyl cellulose with nitrocellulose and with coumarone-indene resins can be utilized in making molded tiles.[15] On the other hand, the incompatibility of ethyl cellulose with polystyrene can be used to produce articles with mottled or striated effects.[16]

Process improvements

The composition of the alkali cellulose used is recognized as one of the most important factors in the preparation of a cellulose ether. In a general study on the mechanism of etherification of cellulose, the effect of alkali content and concentration was determined.[17] Many new features of alkali cellulose production were described in patents issued during the year.[18]

The ethylation process received considerable attention in the patent literature of 1939. Solvents in which alkali cellulose may be etherified include liquid ammonia,[19] *tert*-butanol[20] and acetals.[21] Quaternary ammonium bases can be substituted for caustic in the etherification reaction[22] and the alkali cellulose can be esterified in emulsified form.[23] Another method of recovering the cellulose ether by distilling off volatile solvent was described.[24]



Dow Chemical Co.'s large modern ethyl cellulose plant at Midland, Mich., is typical of the well-equipped, manufacturing centers throughout the industry

Ethyl cellulose solutions containing alcohols may be bleached to improve their color[25] and the precipitated ethyl cellulose may be more readily washed free of metallic impurities after treatment with dilute acetic acid.[26] Although ethyl cellulose is unusually stable to heat at 120 deg. C., two methods of increasing its stability to withstand prolonged heating at 170 deg. C. were developed.[27]

Methyl cellulose

The first domestic production of methyl cellulose[28] was announced late in the year. Methyl cellulose is a highly versatile water-soluble cellulose ether with a wide range of application, particularly in the manufacture of paper, textiles, cosmetics and food products. It readily yields clear, neutral, aqueous solutions of a wide range of viscosity. It is available in four viscosity types: low, medium, high and extra high. It is odorless, colorless and completely non-toxic. Methyl cellulose coatings are grease-proof, tough and highly flexible. Its properties forecast unusual possibilities as an agent for dispersing, thickening, emulsifying, sizing and coating.

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Laminates

by G. E. LANDT

CONSOLIDATED-DIAMOND FIBRE CO.

NEW developments in the field of laminated plastics have, in general, been designed to extend the scope of the service hitherto furnished by this class of products. A new laminated phenolic resinoid product has been developed to satisfy the need for a material of improved arc resistance. Since laminated phenolics in general are noticeably weak in their resistance to tracking under an arc, the development of an arc-resistant material was undertaken. The material consists of thin plies of vulcanized fiber laminated with an arc-resistant resin. The fiber is used in thicknesses of .005 in. to .010 in. and is available in sheets and tubes. The arc resistance of the product is equivalent to that of vulcanized fiber. Its moisture resistance is in line with kraft-paper-base laminated phenolics and it shows no more tendency to warp than the latter. It will machine and punch with satisfaction.

A laminated glass-fiber product bonded with synthetic resin particularly of the phenolic type is now available after an expenditure of considerable effort to obtain a material which justifies some of the promises which the substitution of glass fibers for cellulose fibers seems to offer. Glass fabric laminated with phenolic resins will produce insulation with a power factor characteristic of 1.2 percent and a dielectric constant of 4. A 24-hr. water absorption of .5 percent ($^1/_{16}$-in. thick) can be expected. This laminated glass-fiber product is available in sheets and tubes. It is especially valuable where machined parts must hold close dimensional tolerances under conditions of immersion in water.

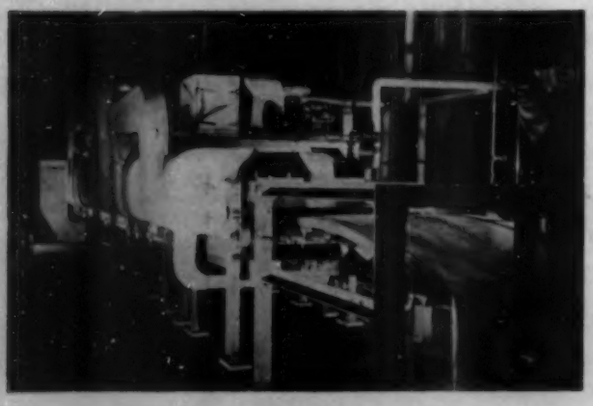
The corrosion resistance of laminated materials has received considerable additional study and a product is now available which has shown very superior performance in resistance to sulphuric and nitric acids in concentrations of 10 percent and thereabout. This product is built up from laminations of asbestos cloth treated to remove the cotton fibers and is impregnated with a phenolic resin of unusual chemical resistance.

It is desirable for laminated materials to possess self-lubrication features. In spite of the heterogeneous character of laminates, it has not been possible until the last year to develop this quality to any significant degree principally because the introduction of lubricants invariably impaired other important physical properties. It has now been found possible, however, to introduce 8 to 10 percent of flake graphite into fabric base materials without impairing physical properties.

The backs of refrigerator doors are now being molded from laminated paper in one piece. This may permit economies in assembling doors and with some designs gives a door with improved thermal efficiency. These doors are being used in some designs of refrigerators.

Two new departures in the field of laminates have been brought to the point of commercial utilization. A laminating sheet enriched by lignin derivatives recovered from spent sulphite liquor is available for the production of a lignin-resin-bonded product with interesting physical characteristics and promising commercial possibilities. A low cost material for phonographic recording disks consisting of laminations of resin and paper to produce records for home and business recording has now been developed.

Large machines impregnate and dry long rolls of paper or canvas which are basic materials in manufacture of laminated sheets, rods, tubes and special forms. (Photo, courtesy General Electric Co.)



Phenolic Resins

by L. M. DEBING

RESINOX CORP. (PLASTIC DIV., MONSANTO CHEMICAL CO.)

PHENOLIC resin technology has shown definite progress for the year 1939. A literature survey, however, shows a disproportionately small amount of published work on theoretical investigations as compared to the advances made in molding technique and material applications. Phenolic resin manufacture requires the use of all the knowledge gained by research to adequately control and evaluate the product, and such research need not primarily point to new products to pay its own way. Articles on *The Polymerization Process*,[1] the *Mechanism of Reaction: Formaldehyde Condensation with Phenol and Its Homologs*,[2] and the

A Molding Triumph Linked with TENITE

Bag chains molded by Tilton & Cook Company

Injection-molded Tenite makes the first plastic weldless chain. The usual operations of shaping, cutting, threading, and cementing, are all eliminated by the ingenious mold design. Severing the links from the runners of the casting is the only finishing required.

The chains are exceptionally strong, due to the toughness of the plastic, and are light in weight. They come from the mold with a high polish and can be made in transparent, translucent, opaque, or variegated colors.

The excellent molding properties of Tenite have made possible the manufacture of many intricately designed products—at less cost and in less time than they could be machined or cast in any other type of material. A book describing Tenite and its many uses will be sent on request.

• • •

TENITE REPRESENTATIVES. *New York*, 10 East 40th St. *Buffalo*, 1508 Rand Building. *Chicago*, 2264 Builders' Building. *Detroit*, 904-5 Stephenson Building. *Leominster, Mass.*, 39 Main St.... Pacific Coast: Wilson & Geo. Meyer & Company—*San Francisco*, Federal Reserve Building; *Los Angeles*, 2461 Hunter St.; *Seattle*, 1020 4th Ave., South.

TENITE an Eastman Plastic

TENNESSEE EASTMAN CORPORATION, KINGSPORT, TENN. *Subsidiary of the Eastman Kodak Company*

Plasticity determination is one of many laboratory procedures in the development of new and better materials. (Photo, courtesy Monsanto Chemical Co.)

Structure of Phenoplastics[3] are concerned with this type of research and experimentation.

New data on the hardening process of phenol-formaldehyde resins[4] from a chemical point of view and as determined by physical means [5,6] of plasticity determinations have been obtained. A series of thought stimulating letters[7,8,9] concerning the structure of phenol-resites appeared in a British magazine.

Active investigations are also being made on the two principal raw materials of phenolic resins as shown by articles on *Phenols in Low Temperature Tar*[10] and the *Refining and Concentrating of Crude Formaldehyde.*[11] A short review of the three principal methods for synthetic phenol production is covered in an article on *Synthetic Phenol Processes*[12] and a patent[13] has been issued on a process for cracking *o*-cresol to obtain meta and para cresols.

A pictorial flow sheet of phenolic resin production,[14] and article on nickel and monel equipment[15] and resin plant design[16] show activity on problems of processing.

Problems confronting the molder as well as the producer of plastics in producing precision moldings[17] have been thoroughly tabulated and many of the problems mentioned in this article are being actively investigated by Committees D-9 and D-20 of the American Society of Testing Materials.[18] This society recently issued a tentative test for the resistance of plastics to chemical reagents[19] and appearing in the society's official bulletin is an article on the calculation of modulus of elasticity by flexural strength determinations.[20] An article on *Load-weighing and Load-indicating Systems*[21] appears in the same bulletin. An article *Investigation of Impact Strength of Plastics*[22] covers the critical effects of hammer weights and velocity as related to impact values obtained. The effect of temperatures ranging from −70 to 200 deg. C. on the various physical properties of 26 different plastics is covered in a series of articles on the *Influence of Temperature on Strength of Plastics.*[23]

Considerable interest has been aroused during the past year by the progress being made on the injection molding of thermosetting plastics. An article on *Injection of Thermosetting Plastics*[24] describes in detail the various methods used abroad. Most of the methods described appear to be an adaptation of the transfer method[25] of molding; however, injection molding of thermosetting plastics as practiced in the injection molding of thermoplastics is being developed in this country.[26] A large number of new automatic molding machines have appeared[26] which can take full advantages of the fast curing materials developed for their use. The development of prevulcanized latex molds[27] broadens cast phenolic possibilities.

The principal items of interest in the field of plastic applications are in the "fabricated preforms" for large moldings such as used for molding the experimental trunk door of the Mercury car,[26] the widened scope of cast phenolics as shown by the nine-foot statues[28] exhibited at the New York World's Fair, and in the phenolic resin possibilities in plywood.[29] The problem of bonded plywood and resin-treated wood has been stimulated by the interest of the aircraft industry.[30,31] An article on *Resin-Treated Plywood*[32] points out advantages to be gained by synthetic-resin formation within the wood structure.

No attempt has been made in this summary to list the patents obtained on new phenolic resin materials since practically all such patents are improvement patents on already existent materials. Such references would not reveal the advances made in increased moldability, speed of cure, and the improvement of finishes especially noticeable in deep draw pieces such as radio cabinets. Very definite progress has also been made in the production of colored molding powders less sensitive to mold temperature variations and colors resistant to various forms of bleeding are increasing rapidly.

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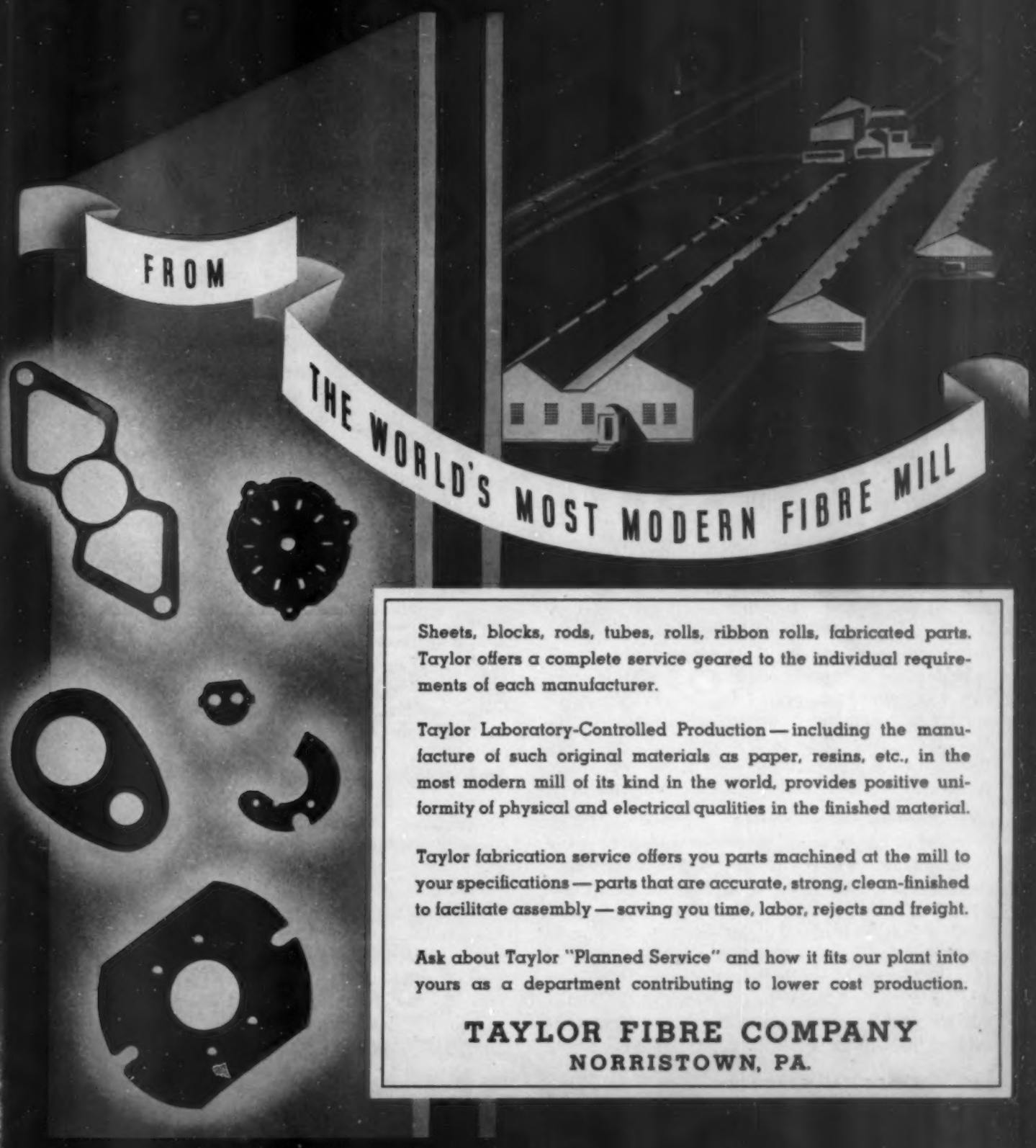

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21. Load-weighing and Load-indicating Systems. C. H. Gibbons. A. S. T. M. Bulletin No. 100 (Oct.).
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Thermoplastic Resins

by H. S. BUNN

CARBIDE AND CARBON CHEMICALS CORP.

TO OBTAIN evidence of the rapid development and ever-increasing uses of truly synthetic thermoplastic resinous products, one has only to look at the steady expansion in facilities for commercial production of the resins. In the automotive field, for instance, one notes the important expansion resulting from the standardization on safety glass made with vinyl butyral resin interlayer by over 75 percent of the industry.[1] Looking at the thermoplastic resin field as a whole, the developments having perhaps the most far-reaching influence are the new textile fibers made from polyamides[2] and polyvinyl esters.[3] Commercial production of yarns, fabrics, felts and other textiles from these fibers is being rapidly established. Other major accomplishments include the further commercial availability of cast sheets of methyl methacrylate,[4] plasticized[5] and unplasticized[6] calendered sheets of vinyl chloride-vinyl acetate copolymer resins, and sheets and film[7] of polystyrene. Injection molding compounds are now offered in all these resins, among the most recent and promising being those composed of the vinyl chloride-vinyl acetate copolymers. Studies of cold flow have already helped to improve the design of molded thermoplastic products.[8] It is interesting to note that products made from the truly synthetic thermoplastics won almost one-half of the Major Awards in the 1939 Modern Plastics Competition.[9]

Acrylates and Methacrylates

Resins of acrylic esters have been subject to many investigations. Patents have described the manufacture of granular acrylic or methacrylic ester polymers,[10] of bulky, porous, acrylic or methacrylic acid nitrile or ester polymers,[11] of flat sheets,[12] of moisture-proof photographic film,[13] and of a new baking varnish.[14] The use of acrylic resins as denture materials[15] and for synthetic finishes[16] has been suggested. Methods for working acrylic resins have been highly developed.[17] A recently introduced acrylate resin sheeting is now used for photographic equipment wherein the corrosion resistance of the resin is beneficent.[18] The literature has summarized the physical properties, solubilities and compatibilities of methyl methacrylate resin.[19,20] This resin now forms the tail lights and directional signal lenses of one make of automobile, the radiator ornaments of two, steering wheel hub insignia, edge-lighted speedometer, radio, and clock dials,[21] and, in fact, the entire body of one car displayed at the New York World's Fair. New reflector signals of this resin are visible for 1/4 mile,[22] and are finding increasing use as highway markers of the prism-reflector type. Denture blanks made by plasticizing methyl methacrylate polymers with the monomeric material have yielded dentures of extraordinarily good quality. The monomer is polymerized by heat in the molding operation.[23]

Polystyrene

Because of its excellent dielectric properties, polystyrene is becoming more and more useful as an electrical insulator.[24] Polystyrene film, now available, has many practical advantages for electrical insulation, especially in the manufacture of electrical capacitors. This film replaces other materials as the insulation in wound capacitors for radio apparatus and other types of electrical equipment. Its low power factor produces capacitors which are extremely efficient.[7] Besides being made into plasticized film, polystyrene has been made into sheet, and treatments have been found to stabilize it against surface frosting and to eliminate checks or incipient surface cracks in the unplasticized material.[25] A new application in the surface coating field employs styrene as the major constituent of the resin-forming materials. Molded polystyrene closures are being used to package mineral acids, each acid being identifiable by the color of the closure.[26] Injection moldings of the resin are being used in increasing quantities for synthetic gems[27] and ultra-high-frequency radio parts. Because it is not appreciably affected by low temperatures or high humidities, the resin is useful and decorative in home refrigerators.[26]

Polyvinyl Acetals

Polyvinyl acetals is the generic term used to designate several resins with properties which depend on the particular aldehyde used for reacting with the hydrolyzed polyvinyl acetate. Polyvinyl formal is now used as a gasoline hose, pipe and tank lining.[28] The unplasticized resin is used for articles requiring exceptionally high strength.[29] Polyvinyl formal resin is one of the better electric wire insulations because of its abrasion resistance, its resistance to cracking, its flexibility and its resistance to oils and chemicals.[30,31,32,33] Owing to its use as a safety glass interlayer,[34] polyvinyl butyral has become a large tonnage product. Strong, tough resins, for safety glass interlayers, are now made by acetalizing polyvinyl alcohol to the extent of 54 to 78 percent with butyraldehyde, 62 to 88 percent with propionaldehyde, or 39 to 58 percent with valeraldehyde, and then by plasticizing the product with triethylene glycol di-2-ethylbutyrate.[35] New techniques have been

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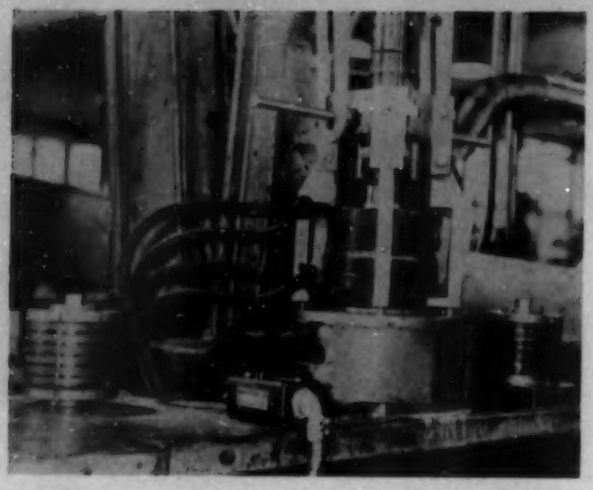

Vinyl resin adhesives both bond and insulate laminations for small electric motor coves. Left, before; center, during; right, after assembly by heat and pressure. (Photo, courtesy Ajax Electrothermic Corp.)

developed to apply synthetic resin interlayers to safety glass,[36] even to curved plates.[37]

Polyvinyl Acetate

Advances during the past year have placed polyvinyl acetate resins among the most important industrial adhesives. They are now used for sealing paper containers, for securing bottle cap liners to cork seals, for a floor tile bond, for a wood putty binder, for labeling and decorating textile products, and for many similar applications. A modified polyvinyl acetate has been developed which possesses exceptional strength in bonding metal to metal. It is being used in commercial quantities for laminating metal sheets to form electric motor cores.[39]

Polyvinyl Chloride

Polyvinyl chloride resin products have been used in rapidly increasing quantities for electric cable and wire insulation.[38] Together with asbestos[38] or aluminum foil[39] the resin has been made into new types of cable jackets. Other important uses are for fabric treatments, as a water- and stain-proof coating, for adhesives,[40] and for impregnating fabrics used for wrapping pipe lines in corrosive soils.[41]

Vinyl Chloride-Vinyl Acetate Copolymers

The tonnage of vinyl chloride-vinyl acetate copolymer resins—has been very markedly increased during the past year by the commercial introduction of plasticized and unplasticized sheets, and injection molding compounds. Sheeting is used for making drawing instruments, radio dials, bookbindings and storage battery separators.[39] In plasticized form it is useful for a new type of leather substitute.[5,42] Other applications of these resins include extruded cable coatings,[43] and, in the form of calendered film, as cloth adhesives and laminated coatings over printed matter.[39] Wall covering and bottle cap liners[45] are also now being made with these resins. Vinyl resin coatings have assumed considerable importance during the year. New applications include coatings for aluminum foil food wrappers[45] and hard rubber.[47] Methods for coating iron, tinplate or galvanized surfaces have been introduced, with[48] or without[49] primer coats. Transparent wrapping foils are moisture-proofed with a coating containing wax and a vinyl resin.[50] Paper backing for photographic film is coated with a cellulose ester and a polyvinyl ester to give a moisture-proof, non-fogging, non-mottling film.[51]

Synthetic Fibers

In the past, synthetic textile fibers have been made from various resins, including vinyl acetate, polystyrene, methyl methacrylate and others.[52] An outstanding development in 1939 is the commercial availability of two new, entirely synthetic fibers—one a condensation product of adipic acid and hexamethylenediamine[53] and the other a copolymerization product of vinyl chloride and vinyl acetate.[3] Polyamide fibers were first produced by Carothers in 1932.[53] It is only recently that they have been made commercially available in the form of full-fashioned hosiery,[2] fish lines and leaders, surgical sutures, toothbrush bristles and various textile products. Arrangements have been consummated for the production of the fibers from vinyl chloride—vinyl acetate copolymers. Commercial articles of the vinyl fibrous material have been available for several months, their first industrial use being for chemical filtering fabrics.[54] It is expected that they will also be adaptable for full-fashioned hosiery. Because of their thermoplastic properties, they are being used in a variety of new felts.[3,54,55]

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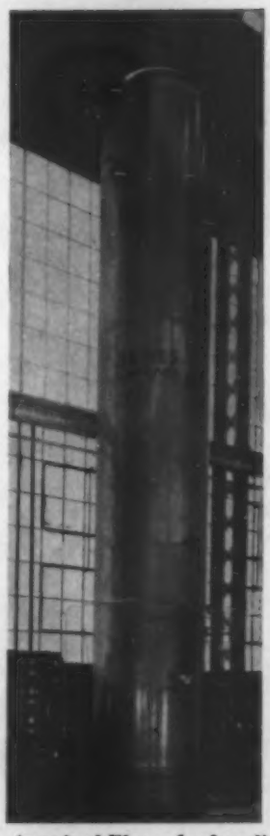

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Urea Resins

by M. H. BIGELOW

PLASKON CO.

UREA resins have continued their upward expansion during the past year. The consumption of urea resins has proceeded along four major lines, namely: molding compound, impregnating syrups, adhesives and lacquer constituents. In the molding compound field there has been a sharp increase in the acceptance of ureas for several new uses, particularly in the field of sanitary appliances. This is because of certain desirable qualities, such as surface hardness, color permanence, and resistance to disinfecting fluids.

The technology of urea plastic lighting materials has kept apace with the times and during the past year a new type of color was developed for commercial lighting fixtures, embodying what is known as a daylight effect. The plastic has been engineered so that the light emitted appears to be more nearly a true white and there has been no accompanying decrease in the efficiency of the reflectors.

Manufacturers of urea resins, through chemical research and better control, have developed satisfactory softer types of plasticities. This enabled the molder to produce larger pieces with his present equipment and to double up his capacities by running multicavity molds, particularly of the larger size which were formerly restricted to single units.

As has been pointed out by MacHale in the October 1939 issue of MODERN PLASTICS, the urea manufacturers have learned to interpret their testing methods so that they are able to predict more reliably the suitability of urea plastics for various applications. This is particularly true with respect to lighting materials where thickness, color and depth of design have a startling effect on the appearance of the reflector when lighted.

With respect to the molding of thermosetting urea plastics, it is interesting to note that this year there has been a serious attempt on the part of several engineers to produce equipment for satisfactorily molding thermosetting compounds by injection processes. The C. D. Shaw Laboratories have produced an experimental machine, mentioned in the July issue of MODERN PLASTICS, in an article entitled *The Changing Pace*, by E. F. Lougee. Mr. Shaw's machine has been demonstrated to the engineers of representative molders throughout the country and they have appeared to be rather enthusiastic with respect to its possibilities. In line with Mr. Shaw's revelation is the announcement of the injection molding of thermosetting resins by Mr. Johannes Neupert in an article entitled, *Injection Molding Thermosetting Resins*, appearing in the June issue of MODERN PLASTICS.

Some advance is being made with respect to the continuous extrusion of urea plastics and this seems to be developing into a commercial possibility due to the efforts of certain engineers on the west coast. An experimental machine has been built which is in production, and undoubtedly in the near future there will be more information regarding its use.

Urea laminations are being widely accepted by the trade, particularly for the manufacture of large panels, such as are used in the manufacture of refrigerators. These laminations are really two surfaces of urea-impregnated material between which is sandwiched a solid paper base, the final piece being white, opaque and quite similar in appearance to porcelain enamel. These laminations are pressed to the desired shape and there is no segregation of the surfacing sheets at the corners. In an article, *New Materials in Refrigerators*, appearing in the May issue of MODERN PLASTICS, it is pointed out that the white laminated panels for the inside of refrigerator doors result in the following advantages: simplified door construction, better thermal insulation, increased durability and decreased weight. This is a rather new feature and undoubtedly in 1940 we will note an extensive increase along this line.

Another advance in the field of urea coatings is embodied in U. S. Patent No. 2,178,358 in which it is revealed that a permanent surfacing may be applied to phenolic and other suitable laminations by a spray coating method wherein a urea-formaldehyde resin surface is built up and pressed to set, yielding a final finish which has most of the properties of molded ureas. Properly treated base sheets are covered with a facing sheet upon which has been sprayed an aqueous suspension of finely dispersed urea plastic substance. The sandwich is pressed between heated platens.

(*Please turn to next page*)

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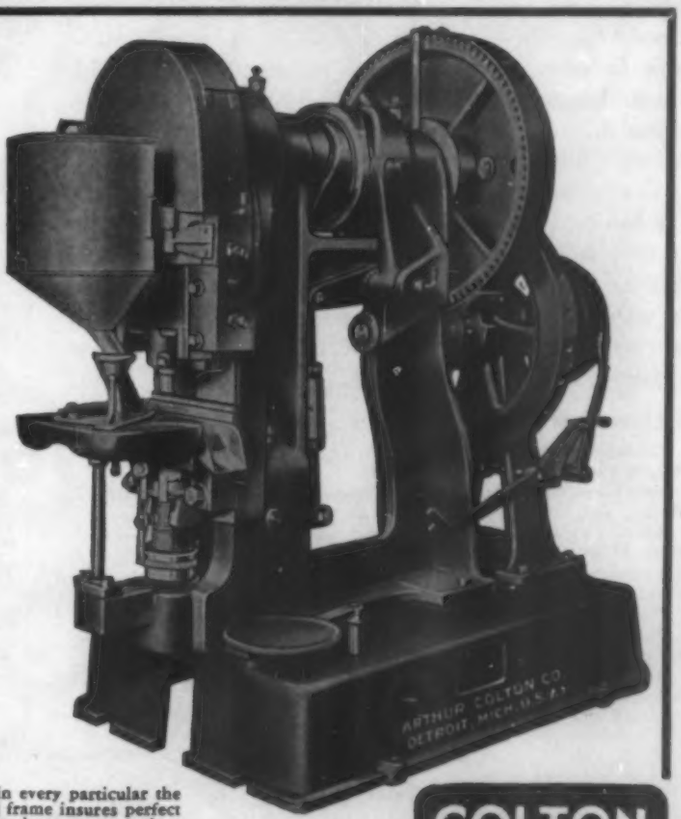

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COLTON DETROIT

There has been a distinct upward swing in the use of urea-formaldehyde type adhesives for plywood and other similar gluing processes—this due to the fact that this year there have been introduced on the American market new improved types of urea adhesives, suitable for both cold and hot pressing. The new glue is still a urea-formaldehyde type but is available in the dry powder form. It dissolves readily in water and prior to mixing is stable for a year or more. Liquid urea-formaldehyde glues are unstable with the result that the user hesitates to keep any excess stock on hand. With the new powdered glue this objection is entirely eliminated, and an entire order can be shipped at one time, if the customer wishes, without danger of spoilage during storage. Another point in favor of the dry glue is the fact that since it is stable, large quantities may be made, and by thorough blending a uniformity is obtained never before found in urea-formaldehyde adhesives. Still another point in favor of the powdered glue is the fact that great savings in shipping costs can be effected due to the complete absence of water, and the fact that it can be shipped in bags. Due to the waterproof nature of the bond and the means now available for protecting the surfaces, newer fields have been opened up for urea-glued plywood.

There has been introduced to the market also wood veneers under the name, Parkwood, impregnated with suitable plastics and bonded to various backings, yielding an entirely new type of building and decorative material. This new material utilizes a combination of urea translucent plastics and an open weave wood veneer in white and opaque colored sheets suitable for constructions where a certain degree of light transmission is desirable. Other forms are available using different textures combined with urea plastics, suitable for permanently finished decorative panels.

Continued research in the field of urea resin syrups for baking enamels has resulted in a wider knowledge of their technology resulting in an increased use of such baking enamels where the permanence of the finish as well as harder surfaces are requisite. These finishes are well suited for automotive finishes where outdoor exposure is particularly severe.

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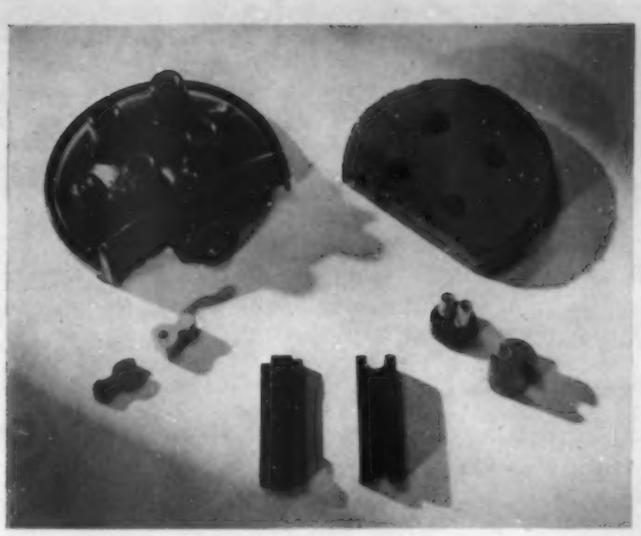

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This digest includes each month the more important articles (wherever published) which are of interest to those who make plastic materials or use them. Requests for copies of the magazines mentioned should be directed to the individual publishers whose addresses will be mailed upon receipt of a self-addressed stamped envelope.

General

GLASSES, ORGANIC AND INORGANIC. H. Moore. Chem. and Ind. *58*, 1027–37 (Nov. 25, 1939). A discussion of the nature and structure of organic and inorganic glasses and their physical properties. Particular attention is given to correlating structure and properties. The most serious disadvantage of the silica glasses is their brittleness and it is for purposes where brittleness is to be avoided at all costs that the organic plastics have their proper field of application as glasses. In making improved glasses the plastics chemist may, if he chooses, refuse to accept any limitations short of the diamond (carbon) itself, whereas quartz (silica) must be considered as the limit to which the glass chemist may aspire. To produce an organic plastic having properties comparable with ordinary glass will involve much closer packing of the constituent atoms than has been achieved up to the present time, with corresponding increase in density.

THE FUTURE PROGRESS OF MOLDING. J. E. K. Beard. Trans. Inst. Plastics Ind. *8*, 111–23 (June 1939). The keynote will be specialization of production, equipment and methods. An increasing number of manufacturers in various industries will adopt plastic molding for quite specific purposes and they will demand equipment particularly suited to their requirements. The motor-car and aircraft industries can absorb vast quantities of large constructional moldings, and architectural components such as window casements, door frames and architraves would constitute a market of almost unlimited possibilities. If strength has to be imparted by the incorporation of highly fibrous fillers, a very special molding technique and an elaborate preforming operation will probably be involved.

SOME FACTORS INFLUENCING THE DEVELOPMENT OF PLASTICS. R. P. Cartwright. Trans. Inst. Plastics Ind. *8*, 74–95 (June 1939). A survey of the properties of various types of plastics and their relation to the utilization and design of molded products.

Materials and Manufacture

SYNTHESIS OF LIGHT-COLORED AND NON-DARKENING PHENOLIC RESINS. W. Lück. Kunststoffe *29*, 306–7 (Nov. 1939). Light-colored products were obtained by using dimethylolurea as a hardening agent for converting phenolic resols (stage A resins) to resites (stage C resins). The use of oxamide and paraformaldehyde as hardening agents yield resins of increased light stability. Resins of still greater light stability can be produced by the condensation of dioxane and phenolic compounds.

MODERN ORGANIC MATERIALS AT THE SWISS NATIONAL EXHIBITION, ZURICH, 1939. Hans Stager. Brit. Plastics *11*, 254–7 (Nov. 1939). The properties of three products manufactured by the Society of Chemical Industry in Basle are described, namely: *Cibanoid*, a urea-formaldehyde resin; *Cibanil*, an aniline-formaldehyde resin; and *Melopas*, a melamine-formaldehyde resin. The latter can be obtained as a thermosetting molding powder which will yield glass-clear products, resistant to dry heat, dilute acids and alkalies, and hot water.

Molding and Fabricating

MODERN MAINTENANCE METHODS FOR THE PLASTICS INDUSTRY. C. W. Brett. Brit. Plastics *11*, 278–9 (Nov. 1939). Welding of breaks in molds, shafts and in the main body of presses can be done at about one-fifth the cost of the replacement part and with an absolute guarantee of the repair.

HYDRAULIC MACHINERY AND THE PLASTICS INDUSTRY. M. R. Rhodes. Inst. Mech. Eng. J. and Proc. *141*, 143–9 (Sept. 1939). A review.

Applications

USE OF HOT-PRESS PLYWOOD IN REFRIGERATOR CARS. Refrig. Eng. *38*, 320 (Nov. 1939). A new type of refrigerator was recently completed in which cresol-formaldehyde-resin-bonded plywood was used for the exterior car siding and all interior construction. The use of this weatherproof product reduced the number of individual pieces and joints in the car about 89 percent. The saving in weight amounted to 3100 lbs. per car over the conventional type of construction, an important factor to be considered if the idea is transplanted to the motor truck industry.

DURISOL FISH-PLATES. Plastics *3*, 327 (Nov. 1939). *Durisol* is a resin-impregnated, laminated and compressed beech wood of specific gravity 1.4. Its properties can be varied by arranging the alternate layers of fibers parallel, at 90 deg., or at 45 degrees. The insulating fish-plates for railway tracks are of the first type and have high tensile and flexural strengths and excellent insulating qualities. The practically isotropic material of the third type is the best material for the manufacture of rollers and noiseless gears.

MOLDED MOTORCYCLE FRAME. Kunst.-Tech. und Kunst.-Anwendung *9*, 402–3 (Nov. 1939). The use of a resinous composition containing paper strip or canvas filler to mold motorcycle frames is covered in a patent recently issued to the Auto-Union in Germany.

POLYSTYRENE. W. C. Goggin. Chem. Ind. *45*, 674–8 (Dec. 1939). The solution of production problems resulting in the removal of objectionable impurities, the development of injection molding techniques, economical price, together with the outstanding properties of the material have combined to give polystyrene an increasingly important place in the plastics industry. Its applications include electrical insulation, illuminated instruments, radio coil dope, bottle closures, dispensers for corrosive chemicals, and films and sheets for packaging and transparent coverings.

Coatings

FILM-FORMING PLASTICS. EFFECT OF SOLVENTS, DILUENTS AND PLASTICIZERS. F. W. Reinhart and G. M. Kline. Ind. Eng. Chem. *31*, 1522–29 (Dec. 1939). Data are presented on the solubility of various plastics in 21 common organic solvents and mixtures of solvents and diluents, and on their compatibility with 39 plasticizers. The degree of flexibility, clarity and shrinkage obtained with films prepared from plasticized compositions is reported. Formulas for airplane dopes which will yield films of optimum flexibility and shrinkage are listed.

HOT SPRAYING OF SHELLAC. Chem. Age (London) *41*, 345 (Nov. 18, 1939). Shellac powder of 100 to 150 mesh is projected at a velocity of not less than 50 feet per second through a blowpipe flame about 4 to 5 in. long. The fused particles form a well-bonded coating upon many types of surfaces. An average loss in combustion of 13 percent shellac was noted.

Testing

PREPARATION OF MOLDED SPECIMENS. H. Rupprecht. Kunststoffe *29*, 300–2 (Nov. 1939). The effects of pressing temperature, pressure, and time, granular size and softening point of the plastic, position of the knockout pins, possible thickness variation, preparation of the preforms, and various specimen shapes on the properties of standard test specimens are discussed.

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STRESS-RELIEVING PLASTICS. W. L. Semon (to B. F. Goodrich Co.). U. S. 2,176,153, Oct. 17. Producing grain-free thermoplastics by calendering a sheet of the material, then floating the sheet on a non-reactive liquid hot enough to soften the thermoplastic.

FIBER BOTTLES. W. D. Bowlby and M. L. Little (to Hercules Powder Co.). U. S. 2,176,166, Oct. 17. Proofing a fiber milk bottle by coating it on the inside with an emulsion of nitrocellulose.

CONTAINER. M. Wagner (to Liquid Carbonic Corp.). U. S. 2,175,370, Oct. 17. A container which is both gas-tight and liquid-tight is made by applying a preformed thermoplastic sheet, cold, to varnished paper and folding into container form.

TASTELESS RESIN. C. Bremer (to Atlas Powder Co.). U. S. 2,176,415, Oct. 17. Making an odorless, tasteless resin from an inner ether of a sugar alcohol, a resin acid and an aliphatic dicarboxylic acid.

BATTERY RETAINER. W. E. Kershaw (to Electric Storage Battery Co.). U. S. 2,176,427, Oct. 17. Making storage battery retainers of perforated vinyl resin plates which do not disintegrate when exposed to the battery action in contact with lead peroxide.

SAFETY GLASS. C. Ellis (to Ellis-Foster Co.). U. S. 2,176,837, Oct. 17. A plastic interlayer for laminated glass comprises a resin with nearly the same index of refraction as glass, and a fiber glass filler.

VINYL RESINS. G. O. Morrison and A. F. Price (to Shawinigan Chemicals, Ltd.). U. S. 2,176,859, Oct. 17. Making vinyl acetal resins from the product formed by hydrolyzing a vinyl ester (not vinyl formate).

ABRASIVE. L. V. Redman (to Behr-Manning Corp.). U. S. 2,176,942, Oct. 24. Use of an oil-modified phenolic resin as binder for abrasive grains on sandpaper or the like.

BUTYRALDEHYDE RESIN. Wm. J. Bannister (to Resinox Corp.). U. S. 2,176,951, Oct. 24. Making a resin by alkaline condensation of phenol with butyraldehyde.

SAFETY GLASS. H. R. Marini (to Pittsburgh Plate Glass Co.). U. S. 2,176,997, Oct. 24. Use of an unplasticized resin as the cement, and a plasticized resin as the interlayer, in laminated glass.

ELECTRICAL CONDENSER. P. Schupp and F. Wilke (to Siemens and Halske Aktiengesellschaft). U. S. 2,177,266, Oct. 24. Polymer resin as dielectric in electrical condensers.

COATING. C. Ellis (to Ellis-Foster Co.). U. S. 2,177,418, Oct. 24. Use of low viscosity nitrocellulose and an oil acid modified alkyd resin in coating compositions.

POLYVINYL ALCOHOL. E. Schnabel (to Resistoflex Corp.). U. S. 2,177,612, Oct. 24. Making homogeneous solid molded shapes from powdered polyvinyl alcohol with the aid of a small proportion of a volatile solvent.

ADHESIVE TAPE. R. G. Drew (to Minnesota Mining & Mfg. Co.). U. S. 2,177,627, Oct. 31. Adhesive tape which does not delaminate nor offset the adhesive layer when unwound is made by applying a water-insoluble pressure-sensitive adhesive film to a backing of transparent regenerated cellulose foil.

THERMOPLASTIC SHEETING. E. C. Blackard; J. S. Kimble and E. C. Blackard; J. S. Kimble and J. S. McClellan; J. S. Kimble, E. C. Blackard and J. S. McClellan; J. S. Kimble (all to Eastman Kodak Co.). U. S. 2,177,633, 2,177,658, 2,177,659, 2,177,660 and 2,177,661, Oct. 31. Methods and apparatus for making improved sheets or foils from thermoplastics by extrusion method.

POLYAMIDE FIBERS. D. D. Coffman (to E. I. du Pont de Nemours and Co.). U. S. 2,177,637, Oct. 31 Improving the properties of synthetic fiber-forming polyamides by treatment with formaldehyde.

MOISTURE-PROOF FOILS. R. B. Flint and J. A. Mitchell (to E. I. du Pont de Nemours and Co.). U. S. 2,177,645, Oct. 31. Adding a slip agent, such as a soluble beta-diketone, to film-forming wax coatings on transparent foils, the slip agent being in a separate phase from the coating.

ABRASIVE. S. S. Kistler (to Norton Co.). U. S. 2,177,940, Oct. 31. As a bond for abrasive particles, a rubber composition containing an aniline-formaldehyde resin.

SPRAY COATING. A. M. Howald and L. S. Meyer (to Plaskon Co.). U. S. 2,178,358, Oct. 31. Spraying a surface with a suspension of cellulose particles impregnated with a thermosetting resin, and finishing the coating by hot-pressing.

INSULATED WIRE. D. R. Brobst (to Bell Telephone Laboratories, Inc.). U. S. 2,178,365, Oct. 31. Cellulose acetate, plasticized with triphenyl and tricresyl phosphates and dimethyl phthalate, is used in transparent coatings over fibrous insulation on conductors.

HOLLOW ARTICLES. E. T. Ferngren (to Plax Corp.). U. S. 2,178,393, Oct. 31. Charging an organic plastic into a rotating mold in such a way as to shape the plastic into a hollow film of the desired shape and wall thickness, forcing a hot gas into the mold and then cooling the gas to set the plastic.

STEERING WHEEL. J. B. Tegarty (to Sterling Injection Molding, Inc.). U. S. 2,178,410, Oct. 31. Building up a steering wheel by progressively molding sections of thermoplastic on a preformed frame by an injection method.

PROTEIN PLASTIC. O. Sturken (to Corn Products Refining Co.). U. S. 2,178,924, Nov. 7. Making plastics from zein (corn protein) by treatment with formaldehyde.

IF YOU ARE proposing to modernize your product with plastics, either to reduce costs or to obtain fine color effects and increased decorative value, you will certainly wish to work with one completely integrated organization rather than with two or three scattered concerns.

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YOUR ASSEMBLY should be taken care of on a production line with the speed-up and reduction in costs made possible by the use of modern equipment.

YOUR TECHNICAL problems should receive expert advice based on years of experience.

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Publications

Write for these booklets. Unless otherwise specified, they will be mailed without charge to executives who request them on business stationery. Other books will be sent postpaid at the publishers' advertised prices.

Fortschritte der Chemie, Physik und Technik der Makromolekularen Stoffe

Edited by W. Röhrs, H. Staudinger and R. Vieweg
Published by J. F. Lehmanns Verlag, Paul Heyse Str. 26, München, 1939
Price: (foreign) 17.55 RM paper cover; 18.75 RM linen cover **331 pages**

Recent chemical, physical and technological developments in the realm of high polymers are reviewed by specialists in various fields. The diversified subjects included in this first book of a series which is planned to cover plastics, synthetic fibers, lacquers, cellulose and proteins, will be apparent from the following list of chapter titles and authors. Macromolecular Chemistry by H. Staudinger; Formation of Macromolecules by Polymerization and Polycondensation by G. V. Schulz; Macromolecular Acids and Bases by W. Kern; Chemistry of Phenoplasts by E. Dreher; Physics of Plastics by R. Vieweg; Evolution of Standard Types, State Supervision and Standardization of Testing of Plastics by W. Esch; Test Methods by W. Esch; Electrical Testing and Electrical Properties by G. Pfestorf and W. Hetzel; X-ray Investigations of Fibers in the Solid State by O. Kratky; Production and Molding of Thermosetting Phenolic Resins by W. Röhrs; Manufacture and Uses of Thermoplastic High Polymers by P. Nowak; Technology of Cellulose Esters and Ethers by W. Forstmann; Research and Progress in Coatings by G. Zeidler; and Plant Practice in Manufacture and Application of Coatings by O. Merz. G. M. K.

Selling Is a Game

by Jack McCord
Published by Prentice-Hall, Inc., 70 5th Ave., New York, 1939
Price $2.00 **154 pages**

Here's a book about selling that is brim full of tips, yet easy to read. It is not a text book. Instead, it treats selling as a game. The paragraphs are short, crisp, interesting, timely and helpful to anyone who considers selling as work.

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Modern Publicity

Edited by F. A. Mercer and W. Gaunt
The Studio Publications, Inc., New York & London, 1939
Price: paper, $3.50; cloth, $4.50 **150 pages**

War or no—advertising goes on and choice examples of the advertising arts from Great Britain, France, Germany, Italy, Switzerland, Hungary, Poland, Sweden and the United States have been painstakingly collected, sorted and presented in a comprehensive manner for easy comparison and appraisal. Posters, press advertisements, booklets, even packaging and display, have been treated impartially and the book comprises an important record of the finest individual efforts of the commercial artists of our present generation. Cover, typography and layout are by Robert Harling. Many of the excellent illustrations are in full color. E. F. L.

100 Packaging Case Histories

Edited by Albert O. Maisel
Editor MODERN PACKAGING
Breskin Publishing Corp., Chanin Bldg., New York, 1939
Price $2.50 (Free with a yearly subscription to MODERN PACKAGING—$5.00) **223 pages**

Designing a new package, as many have learned, consists of something more than a pleasing arrangement of type and color. Packaging is generally applied to mass produced merchandise. It is accomplished on automatic machinery which travels at a rate of speed commensurate with large scale production. Bottles and boxes are filled, labeled, capped, sealed and delivered from the production line at the rate of two or three hundred a minute. Collapsible tubes are stamped out automatically, capped, printed in several colors, lacquered and filled from the bottom by automatic machinery which crimp-seals and delivers them to inspectors at incomprehensible speed. This machinery represents big capital investments and must be understood by designers if their new designs are to be usable on present equipment.

Therefore, the experience of other manufacturers and designers in creating successful selling designs is of tremendous importance to those considering packaging changes of any sort. To make this experience available, this book presents Product data, Market Areas and Marketing Conditions, Comparative Package data, Plant Changes and Sales achievements in 100 case histories of well-known products whose packages have been changed within recent years. It is invaluable to any manufacturer or designer as a reference work. To the student, it brings a wealth of information available in no other single source. E. F. L.

THE BUREAU OF FOREIGN AND DOMESTIC COMmerce has recently issued a brief review of the United States Plastics Industry and Trade, written by C. C. Concannon, chief of the Chemical Division, in which preliminary production figures for 1938 are given. James W. Young, director of the Bureau, points out in the Foreword, that the study is necessarily in outline due to the scope of the industry and is devoted chiefly to a description of the principal groups and to a statistical study of production and foreign trade.

ONWARD FROM THE BEGINNING, A HISTORICAL sketch, of the Royle Tubing Machine, recently published by John Royle and Sons, Paterson, N. J., is an interesting, detailed and fully illustrated 104-page account of the principal steps in the development of these machines over a period of fifty-odd years. Earlier models and the latest machines are pictured for ready comparison. Photographs and diagrams show the progress in machine details, such as heads, cylinders, stock screws, tubing head fixtures, driving gears, etc., and various uses for the machines are outlined.

FULL INFORMATION, INCLUDING PHOTOGRAPHS and cross sectional diagrams of automatic time switches said to be suitable for all general-purpose applications, is contained in a pamphlet issued by General Electric Co., Schenectady, N. Y.

DESPATCH OVEN CO., MINNEAPOLIS, MINN., HAS released two completely detailed, illustrated bulletins covering heaters for ovens, dryers and furnaces. One describes a new heavy-duty industrial indirect air heater and the other, a new direct gas-fired recirculating air heater with a controlled combustion feature, said to eliminate fouled finishes and rejects, and to lower operating costs and increase utility.

APPLICATIONS OF METHOCEL, A WATER-SOLUBLE cellulose ether, to paper coating and sizing—to textile, soap, cosmetic and paint fields as a thickening agent—its utility in preparation of pastes, sizes and for thickening aqueous dispersions of casein and rubber latex, etc., are all treated at length in a leaflet prepared by The Dow Chemical Co., Midland, Mich.

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News

THE CENSUS OF BUSINESS LAUNCHED THIS MONTH by the Bureau of Census, Department of Commerce, deserves the prompt and wholehearted response of business men in every industry. Schedules are being distributed this month and your prompt return of the properly filled-in blank will be a real contribution toward making a complete, accurate, and rapid enumeration. This in turn will make the results of the survey more quickly available for your information.

THE ANNUAL SALES MEETING OF THE CATALIN Corp., scheduled for January 4 to 11, was held at sea, in Miami and Havana. William Theile, president, Harry Krehbiel, vice-president, and the entire sales personnel sailed on the *Nieuw Amsterdam* for a full week's vacation with all the trimmings of golf, sun-bathing and deep-sea fishing (with Catalin lures, of course).

GEORGE W. WACKER REPORTS THAT HE IS RESUMing his consulting practice, specializing in injection molding. Associated for the past three years with the Grotelite Co., in their injection press engineering department, Mr. Wacker will now be available to the trade at 4616 Reading Road, Cincinnati, Ohio.

R. W. BAINBRIDGE IS NOW LOCATED IN THE NEW York office of Durez Plastics & Chemicals, Inc., 250 Park Ave. Mr. Bainbridge has been associated with the plastics industry for the past eight years and brings a fund of experience that includes everything from estimating and mold design and construction to final plant production and operation.

DR. AND MRS. LEO NAST, COLONIAL GARDENS, N. J., were recently admitted to citizenship by Common Pleas Judge Adrian Lyon at naturalization hearings. Dr. Nast is vice-president and technical director of Universal Plastics Corp., New Brunswick, N. J., and with Mrs. Nast, came to this country from Germany five and one-half years ago.

OTTO A. HANSEN ANNOUNCES THAT HE RESIGNED as president of the Marblette Corp., 37-21 30th St., Long Island City, N. Y., on December 5, 1939. No successor has been named as we go to press.

COLORFUL PLASTIC DISHES, CUPS, AND SPOONS, light in weight, durable, compact and readily discernible against the snow, will be part of the essential equipment carried in dog sled trail boxes by the U. S. Antarctic Expedition, commanded by Rear Admiral Richard E. Byrd. These sets are made of Beetle, molded by Northern Industrial Chemical Co., Boston. Dr. Hunter F. Passell, geologist at the West Base of the expedition, is shown above checking supplies before packing.

PREVIOUSLY SOLD ONLY UNDER LICENSE AGREEments, its line of Vulcalock cements, described by the manufacturer as one of the most remarkable adhesives ever developed, has now been released for sale on a restricted basis, it is announced by The B. F. Goodrich Co., Akron, Ohio. Vulcalock cements, the announcement says, have enabled users to accomplish assemblies previously considered impossible, particularly in making strong, waterproof, chemically resistant joints between rubber and metals. They also have unique properties in joining a wide variety of other materials, including many synthetic resins, woods and ceramics. Not rubber, but solutions of Thermoprene (a patented thermoplastic made by chemical alteration of rubber) the cements, when dried, form tough, horny films. They are translucent, amber liquids of light engine oil consistency.

DR. FRITZ POLLAK, ONE OF THE ORIGINATORS OF cast phenolic resins, has been retained as technical consultant by the Marblette Corp. Dr. Pollak also maintains a consulting and experimental laboratory at 114 East 32nd St., New York.

THE SYNVAR CORP., WILMINGTON, DEL., HAS DEveloped an odorless resin, suitable for use in the manufacture of laminated breaker strips, panels, etc., for refrigerators. The material can be drilled and punched satisfactorily, it is reported, and will not give off an odor that food in refrigerators will absorb. This new odorless resin can be used in the same manner as other laminating resins, it is claimed.

CELLULOSE ACETATE MOLDING COMPOUNDS reached a production peak of $10^1/_2$ million pounds during the first eleven months of 1939, as compared with $6^1/_2$ million pounds for the corresponding period in 1938. Production of sheets, rods and tubes amounted to $8^1/_8$ million pounds, or about $2^1/_2$ million more than during the same eleven months of the preceding year, and about 4 million less than in 1937.

JOHN S. BARNES CORP., ROCKFORD, ILL., ANNOUNCE the appointment of W. H. Blackmer, of Larchmont, N. Y., as sales engineer in the New England and Metropolitan New York area. Bryant Machinery and Engineering Co., Daily News Building, Chicago, will represent the company in that territory.

FORESEEING THE DIFFICULTIES OF OBTAINING certain waxes, glycerin, etc., due to war conditions, the Glyco Products Co., Inc., 148 Lafayette St., New York, N. Y., have been working for the last twelve months on producing a series of products to replace materials which can no longer be obtained, or are obtainable only at a very great increase in price. Substitutes for carnauba wax, montan wax, beeswax, ozokerite, glycerine, etc., are now available, the company reports.

DR. WILLIAM F. TALBOT WHO JOINED THE STAFF OF Arthur D. Little, Inc., chemists and engineers of Cambridge, Mass., in June, for the purpose of carrying out studies for the General Printing Ink Corp. has recently been made research director of the latter company, in charge of research and development work and of their laboratories in New York City. Arthur D. Little, Inc., will continue to act in an advisory capacity and to carry on special researches.

PERIODICAL PUBLICATIONS, USING PAPER COVERS on which a coating or covering of thin transparent sheeting of cellulose derivative has been placed, or which have been laminated to a film of cellulose derivative, by means of processes developed in recent years, have now been accepted for mailing at the second-class rate of postage, according to the Postal Bulletin of November 7, 1939, provided that they conform otherwise to postal regulations. This privilege has been granted in view of the demands of many publishers who desire to use cellulose-treated paper covers to protect and improve the appearance of their periodicals. (*Please turn to next page*)

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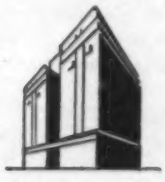

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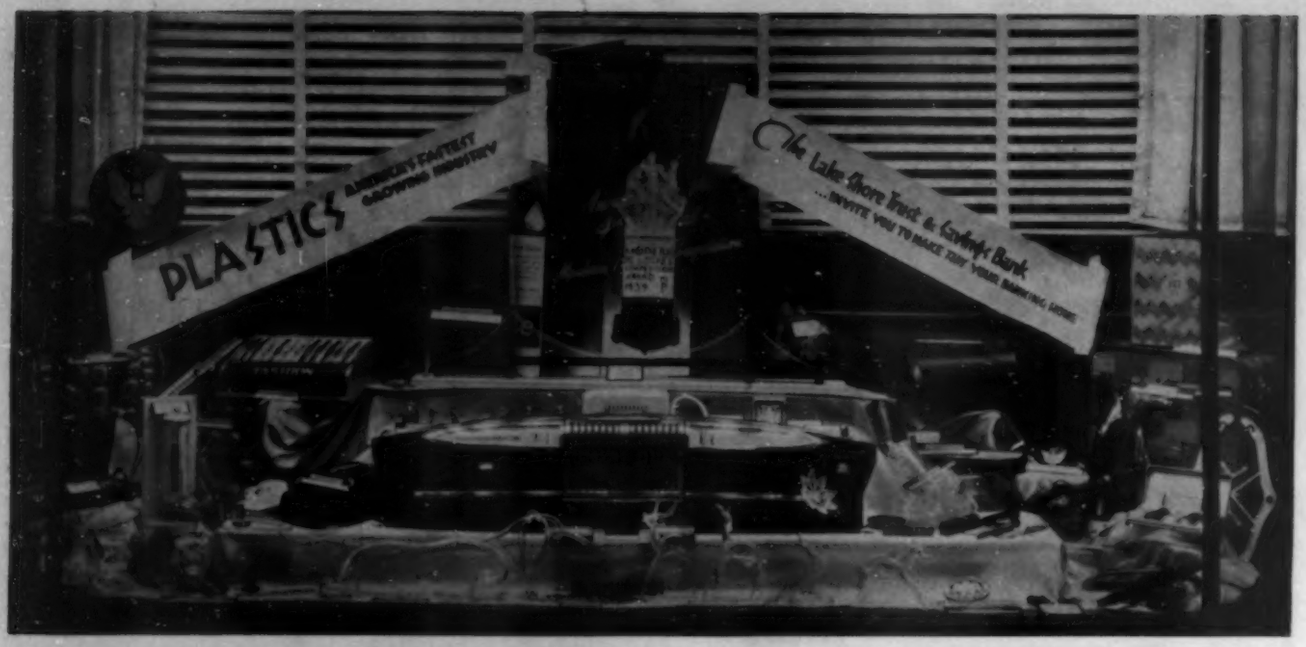


ECHOES OF MODERN PLASTICS' FOURTH ANNUAL Competition—prominent displays of award-winning entries have attracted widespread interest, bringing added prestige to these new plastic products. In Chicago, an exhibit of a variety of these items in a window (top photo) of the Lake Shore Trust & Savings Bank, 601 N. Michigan Ave., has received tremendous attention, as a large amount of traffic passes this corner. Pictured directly above is the front section of the luggage department of R. H. Macy and Co., New York, showing the featured display of Amelia Earhart Parkwood-Textolite luggage made by Orenstein Trunk Corp., along with the handsome plaque awarded in the Decorative Products, Laminated, group of the Competition.

A FAIRLY COMPLETE EXHIBIT OF THE WINNERS IN Modern Plastics' Fourth Annual Competition is available for display in schools, museums, or at business gatherings without cost other than packing and transportation. For open dates and other details, please address Publicity, Breskin Publishing Corp. Chanin Bldg., New York, N. Y.

CLEVELAND PLASTICS CO. ANNOUNCE THEMSELVES as molders with a plant at 12416 Euclid Ave., Cleveland, Ohio. The telephone number is Garfield 2992.

ONE HUNDRED NINETY-ONE PREFABRICATED buildings to house radio facilities along the nation's air routes are being constructed in Milwaukee, Wis., by Worden-Allen Co. on order of the Civil Aeronautics Authority. These represent a part of the C. A. A.'s 1940 construction program, and upon completion will be placed in use throughout the country as an addition to radio *beam* equipment already in use.

Masonite Presdwood is being used over steel frames. Eight carloads of Presdwood, amounting to nearly a quarter-million board feet, have been ordered from the Masonite Corporation.

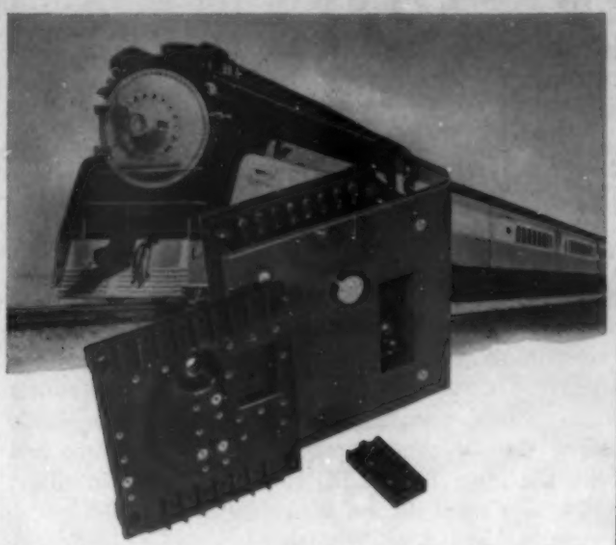
THE SCHOOL OF DESIGN, UNIQUE CHICAGO ART school whose students find the road to art, science and technology at one and the same time, will begin its spring semester, Feb. 12, director Laszlo Moholy-Nagy announces. Courses lead to a designer's diploma after four years and an architect's degree after six years.

PRODUCT STREAMLINING, 5212 WILSHIRE BLVD., Los Angeles, California, reports that it has formed an organization to serve Southern California suppliers of raw materials and molders with a designing, redesigning and styling service.

THE SHERWIN-WILLIAMS CO., CLEVELAND, OHIO, announces the development of Kem Plastite Enamel, specially formulated for finishing plastic materials, and designed to provide thorough adhesion to the hard surface of plastics. Tests on a wide variety of plastic formulations, it is reported, indicate that this finish withstands severe abrasion and impact without marring or chipping—characteristics in which most ordinary baking enamels have proved deficient.

Another finish known as Kem Bakolescent Enamel has also met instantaneous acceptance, it is said, because of the beauty, richness and depth of tone afforded by the opalescent particles, combined with the fact that it is believed to be the first enamel of this type that could be baked without occurrence of unsightly flooding. It also is claimed to show extraordinary adhesion to most plastics. A slight variation in the finish formulation may sometimes be recommended by the company for best results.

Advantages claimed for the use of color finishes on brown plastics in place of using color plastics are threefold: First, there is a very considerable saving in spray applying colors to the cheaper brown plastic material. Second, the appearance is generally superior, and richer colors are possible. Third, manufacturers are enabled to produce all plastic objects in the one cheaper compound, and spray on whatever color is in current demand.



When Traveling Via Pullman your comfort is assured, for each Pullman room accommodation is equipped with an Individual Temperature Control Unit, which insures correct functioning of the cooling and heating equipment. The Individual Temperature Control Unit is a product of the Vapor Car Heating Company, 1600 South Kilbourn Avenue, Chicago, Illinois, and to insure proper insulation of its electrical parts, to effect economies in assembly costs and conserve space, the circuit breaker and base are molded of Bakelite by Chicago Molded Products Corporation.

Another example of good engineering design brought about by the co-operation of our Engineering Staff and the manufacturer. Our Engineering Department is ready to co-operate with you on your specific problem.

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INJECTION AND COMPRESSION
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LITTLE GIANT TOGGLE PRESS

Our Foot Toggle Press fills the gap between the small hand lever press and the large power press. The double set of toggles develops much pressure.

It has a long stroke and a wide working range. The head is equipped with knockout. All wearing parts, pins, and links are hardened.

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Equipment

AN IMPROVED AND SIMPLIFIED, COMPACT PACKless expansion joint for steam and hot water lines is announced by the American District Steam Co. for low and high pressure and temperature service. The joint has an expansion element operating on the principle of cold springing used in the installation of pipe bends. The expansion element is a series of welded U-Rings of corrosion-resistant steel which is welded to the steel body and the guide on the movable sleeve to form a permanent seal between the stationary body and the movable sleeve. The element is compressed axially or cold sprung one-half of the total traverse for installation in the cold line. As the line expands with the application of heat, the compression in the element is relieved and it passes through the neutral position and into tension for the remaining half of the traverse.

A NEW BENCH-TYPE PANTOGRAPHIC MACHINE FOR general industrial engraving work on all materials, and electric etching on soft or hardened steel, has been introduced by H. P. Preis Engraving Machine Co. Separate heads, quickly interchangeable, are used, either for engraving or electric marking.

DESIGNED TO CUT MATERIAL UP TO $1^1/_4$ IN. THICK, the GuildCutter, light, portable electric tool, has recently been put on the market by Syracuse GuildTool Co. Claimed to be especially useful on wood, plywood, masonite, celotex and other building materials, it is equipped with a $4^1/_2$-in. saw blade, can be used with a $^1/_4$-in. width Dado head for ploughing, grooving, tennoning and dadoing, and the base tilts to 45 deg. for beveling.

QUIRK CHARG-O-MATIC, A MINIATURE STORAGE battery for flashlights, Du Pont Plastics Bulletin No. 3 reports, is the equivalent of two standard $1^1/_4$-in. size D dry cells, and easily rechargeable by insertion in a home charger or automobile booster clip.

The battery case is molded of transparent Lucite, selected, according to the release, because it is resistant to sulphuric acid and moisture, practically unbreakable, stable in dimensions and free of metallic impurities. In order to provide for a special spillproof feature and to replenish distilled water, the battery cell is constructed of five dissimilar parts, all of which are molded in one injection in the same die.

HOLD-HEET LANCE PYROMETER, MANUFACTURED by Russell Electric Co., is now being made with a black crackle finish, said to be non-tarnishing and impervious to oil. Used for checking temperatures of molten metal, ovens, hot-plates, detecting hot leaks in boiler heatings, etc., this portable pyrometer is of the direct reading type and has manual cold end adjustment. No battery or electrical connections are needed and easily replaceable tips are claimed to insure long service.

A COMPLETELY NEW TYPE BLUE PRINT MACHINE, embodying as a major improvement the use of the Hanovia Chemical and Manufacturing Co.'s new high pressure mercury quartz lamp, has been announced by Charles Bruning Co., Inc.

In view of tests showing that this new light source overcomes the disadvantages inherent to carbon arcs, Bruning officials say that the new lamp will replace carbon arcs in blue print machines.

AN ALL-PURPOSE WOOD-WORKING TOOL, THE DEwalt Moto Miter Box, is now offered by Dewalt Products Corp., as an ideal tool for home workshops, small shipping departments, carpenter shops, pattern shops, cabinet work, etc. Especially designed for light cutting, it cuts off 2-in. stock. A direct drive motor runs from an ordinary light socket and the arbor can be placed in any position for all sawing operations, it is reported. The machine is said to perform 29 operations.

FRESCO IN FRISCO

(*Continued from page 31*) when edge-lighted or wherever the surface is irregular, cut or engraved, reflecting softer color tones and rainbow flecks of light.

Blending with the neutral amber and mother-of-pearl (the colors used most frequently) the lounge color scheme is black and crystal, accented by turquoise floor covering and chartreuse upholstery for chairs. Four mirror-enclosed columns and the mirror back of the bar, tinted a soft flesh tone, reflect the ebbing and flowing colors of the overhead lights. Curtains are of rayon in natural color over white wooden Venetian blinds. Through curtains, upholstery and rugs runs a wave pattern, repeating the movement of the plastic ceiling design. Four arched entrances, approached from the main floor halls, have walls done in silver, and oval shaped domes, indirectly illuminated.

Angles have been eliminated in a striking way through the use of mirrors, curved architectural forms and black patent leather for the walls, columns and the facing of the bar. Padded to form individual panels, the rounded columns of gleaming leather apply interestingly as a continuation of the sweeping ripples which form the outermost portion of the ceiling design. The 60-ft. serpentine bar has a facing of tufted patent leather to match lounge sofas, adding an ornate roundness to the otherwise flat surface. Rich and luxurious, the smooth surface of the black patent leather, too, reflects the changing lights.

In contrast, the top surface and back of the bar are faced with dull satin-finish laminated plastic material, which is easy to clean, long-wearing and permanent in color and smooth finish. Bar stools have seats covered in turquoise leather set on crystal-clear methyl methacrylate plastic rods, serving as graceful, light-catching, columnar supports.

In front of the mirrored back bar is a spiral wrought-iron trellis, adorned with a display of approximately sixty tropical orchids kept constantly fresh.

Vividly dramatic, lovely in design and execution, the plastic ceiling establishes the spirit of the room. The appearance of delicate fragility and sheer beauty comes from the natural sparkle and quality of the acrylic material itself. The clear transparency, rigidity, edge-lighting properties, ease of fabrication and versatility of acrylic resins make them particularly fascinating for applications where architectural and technical skill can create artistic effects obtainable in no other way.

NYLON IN PRODUCTION

(*Continued from page 33*) ever constructed. The conditioning units are housed in special rooms above the roof. Refrigeration equipment is located in the power plant. The chilled water for the units is piped in underground. Temperature and relative humidity are maintained at a constant throughout the plant.

The plant will produce polymer, as well as yarn;

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Now! Put your plastic finish work on a "Line Production" basis—get high volume production without appreciable waste or "spoilage." Use PORTER-CABLE Wet Belt Sander-Grinder! With this new finish method you can *for the first time* depend on elimination of plastic flow, heating, chipping, discoloring, fracturing and warping of the materials.

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Avoid heating and discoloring. Sand down to feather edge.

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WANTED: Stainless Steel or Nickel Kettle, Vacuum Pan, Hydraulic Press, Preform Machine and Mixer. Reply Box 275, Modern Plastics.

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FOR SALE: Watson-Stillman Hydro-Pneumatic Accumulator, 8" ram, 48" stroke, 42" air cylinder, 5000 lb. PSI, complete with high pressure air receiver and interconnecting fittings; 4—Watson-Stillman 4-cylinder opposed Hydraulic Pumps, 6000 lb. PSI, 25 GPM, motor driven, 100 HP AC motors; 6—24" x 24" Hydraulic Presses 12", 14" rams; 2—30" x 30" Hydraulic Presses, 14" rams; 60" Mixing Rolls. 2—300 gal. Nickel Agitated Jacketed Vacuum Stills; 1—200 gal. Nickel Agitated Jacketed Vacuum Still. Reply Box 326, Modern Plastics.

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PLASTIC MIXING & MOLDING EQUIPMENT—Factory rebuilt—Hot Rolls or Mixing Mills, Hobbing and Die Sinking Presses, Semi-automatic and Standard Molding Presses, Hydraulic Pumps, Accumulators, Intensifiers. Reply Box 294, Modern Plastics.

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WANTED: CELLULOSE ACETATE SCRAP, unground or reground, as well as lumps, also acrylic or methacrylic resin scrap and celluloid scrap. Send details concerning quantities and price. Reply Box 318, Modern Plastics.

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Model and Sample Maker, Designer, married, wishes permanent position with Company needing all-round experience making Models in Plastics, especially Lucite and Plexiglas, for Industrial and Commercial Injection and Compression Molding; Samples for Hair Ornaments; Jewelry, Compacts, Barrettes. Experienced making Latex, Plastics, Plaster Casts. Work from Prints, Drawings, Sketches, Rough Models. Can develop ideas. Reply Box 330, Modern Plastics.

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Molding technician with 18 yrs. experience in all phases of the plastic field available. Has successfully served as chief engineer, production supervisor, superintendent, sales and general manager. Especially proficient in plant layout, mould design and construction. Reply Box 331, Modern Plastics.

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Sales Representatives (2) with thorough knowledge of plastics desire to represent a reliable and progressive firm for the Metropolitan New York area. Active connections with the general Wholesale trade, Chain Stores, direct Premium and Advertising firms and Exporters, also Custom work. Reply Box 332, Modern Plastics.

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Sales Representatives, straight commission basis. Resins for laminating and plywood bonding, etc. New odorless resin ready for market. Synvar Corporation, Wilmington, Del.

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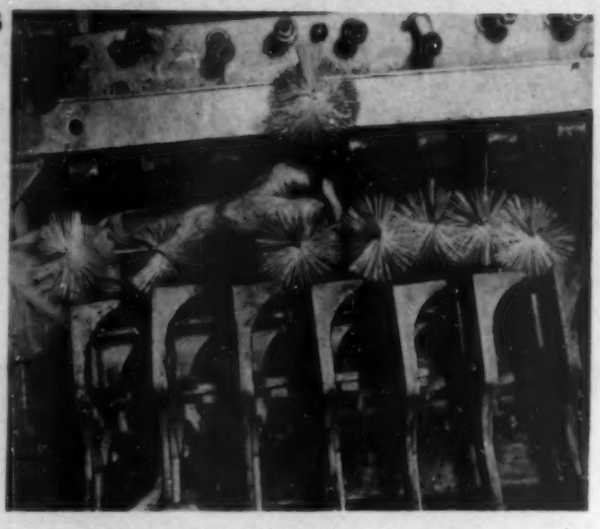

Stiff and penetrating Exton hairbrush bristles are set into a Lucite back and handle **5**. These durable bristles **6** are used in brushes for a bottle cleaning machine

some of the polymer will be made into brush bristles and surgical sutures, among other articles, by the du Pont Plastics Dept. plant at Arlington, N. J. The plant, when in complete operation, will produce approximately 4,000,000 lbs. of nylon yarn a year. About 850 workers will be employed.

Opening of the plant climaxes a ten-year research program. Nylon fibers for textile uses, such as will be manufactured at Seaford, are wholly man-made and have no counterpart in nature. One of the most promising uses is in hosiery. Other textile applications, such as knit goods, underwear and woven dress goods, are the subjects of experimentation.

The nylon process is begun in the du Pont plant at Belle, West Virginia, which has been enlarged in the last year. The *intermediates* made at Belle will be shipped to Seaford.

The Seaford plant site is on the outskirts of the town. It comprises several hundred acres. Two miles of railroad spur have been built in from the Pennsylvania tracks nearby. River transportation will be used for fuel; other shipments will be made by rail or truck.